

MtronPTI...when timing matters

MtronPTI offers one of the broadest product portfolios in the Frequency Control & Filter industry. The focus is to supply advanced products and engineering services unmatched in the industry. Products range from crystals (both commercial and precision), clock oscillators, GPSDO, VCXO, TCXO, OCXO and Modular Timing Solutions to various Filter products, including LC, SAW, Ceramic, Crystal, Cavity and Microwave. Customers can essentially get all Frequency Control & Filter devices from MtronPTI.

MtronPTI's commitment to customers in the markets that we serve is unsurpassed. Military and Aerospace, Telecommunications and Commercial Industry customers rely on MtronPTI's specialized services from design and development to implementation and troubleshooting. Some of the top companies in these fields rely on MtronPTI for all their frequency control and filter needs. Let MtronPTI's professional and knowledgeable team help you design and implement your next project.

MtronPTI Mission Statement

MtronPTI creates highly differentiated value through a comprehensive portfolio of custom and standard Frequency Control and Filter products for global markets demanding high reliability, superior cycle times and flexible supply chain capabilities.



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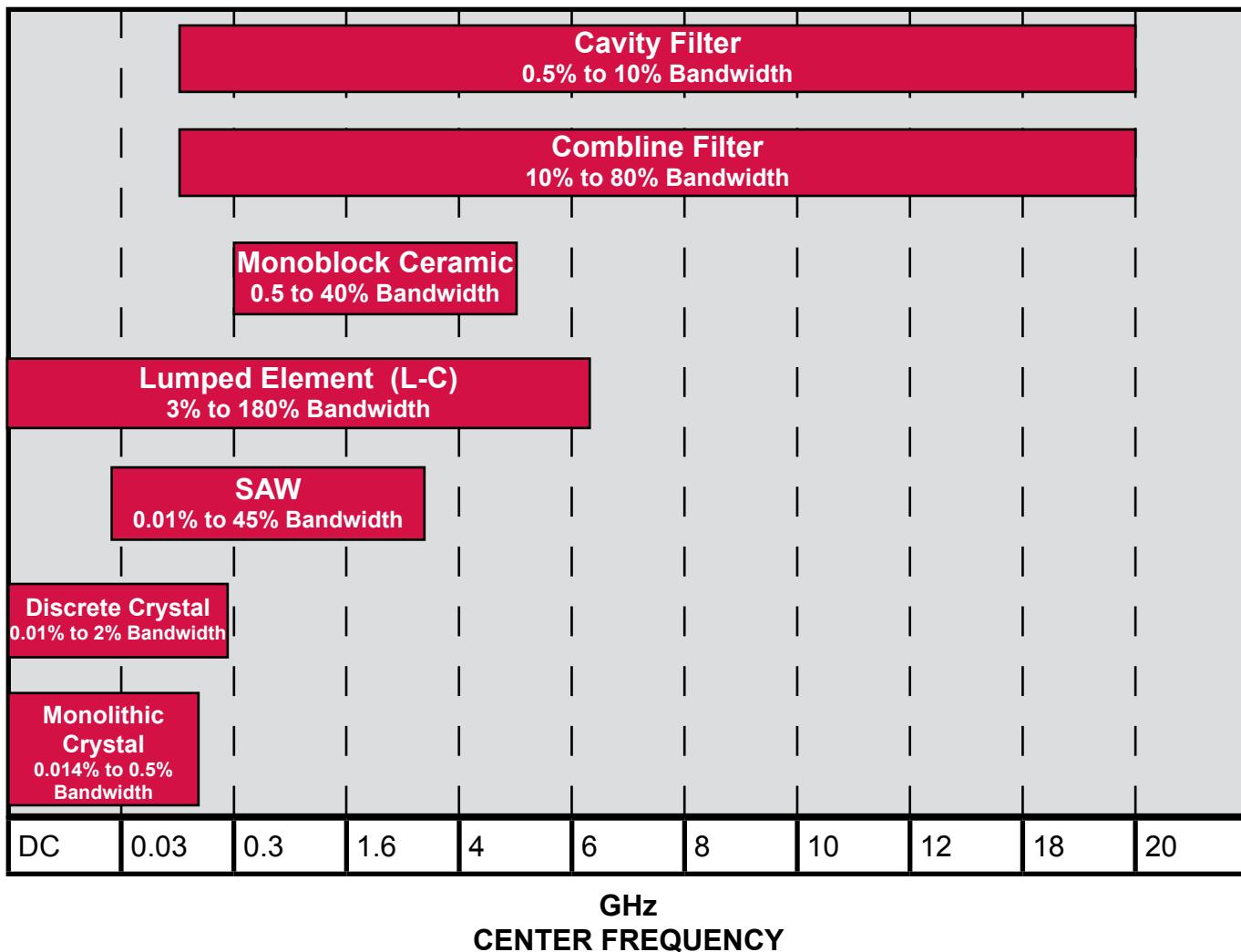
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Products that are RoHS compliant as of January 1, 2005 are labeled with this mark:



Filter Selection Guide

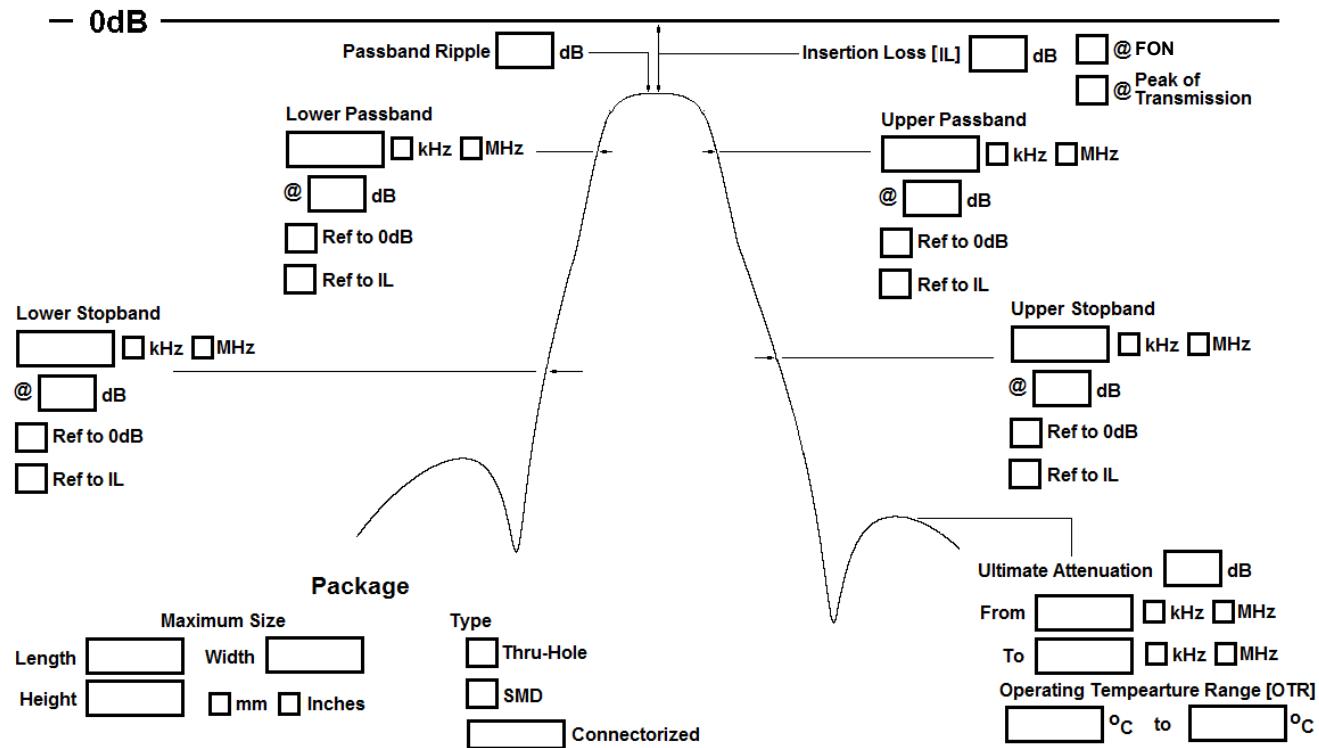


MtronPTI's Filter Capabilities:

- Bandwidths from 100 Hz to 10 GHz (*The bar graph above illustrates where each technology is best utilized in terms of frequency and bandwidth.*)
- Custom design capabilities
- Commercial, Military and Space capabilities
- Laser weld capabilities
- Surface mount applications
- Lead or RoHS capabilities
- No pure tin available on request
- 40+ years of success in the filter market
- Expertise required to serve as a reliable partner in the most challenging product development environment.

Our Application Engineers are available to assist you with your specific filter applications.
Just call 407-298-2000

Filter Specifications



Go to the www.mtronpti.com for the interactive 'Filter Specifier' to define your filter requirements. The following are additional specification points which may be required to properly define your filter.

Additional Stopband Points:

Stopband 2: Lower _____ MHz/kHz Upper _____ MHz/kHz Stopband 3: Lower _____ MHz/kHz Upper _____ MHz/kHz

Group Delay:

Absolute: μsec nsec Differential Group Delay: μsec nsec Over Any _____ MHz _____ kHz Within the Passband

Return Loss: _____ dB minimum Maximum Input Signal Power: Watts dBm CW Pulsed _____ % Duty Cycle

Termination Impedance (ZS/ZL): 50Ω nominal Other _____ Ω // _____ pF

Environmental:

Vibration:

Operating: _____ Non-Operating: _____

Shock:

Operating: _____ Non-Operating: _____

Altitude:

Operating: _____ Non-Operating: _____

Humidity: Condensing Non-Condensing

Operating: _____ Non-Operating: _____

Application (please describe): _____

Contact Information:

Company: _____ Street: _____

City: _____ State (Province): _____ Postal Code: _____ Country: _____

Technical Contact: _____ (Name) TEL: _____ eMail: _____

Project Name: _____ Prototype Date Required: _____ Quantity _____

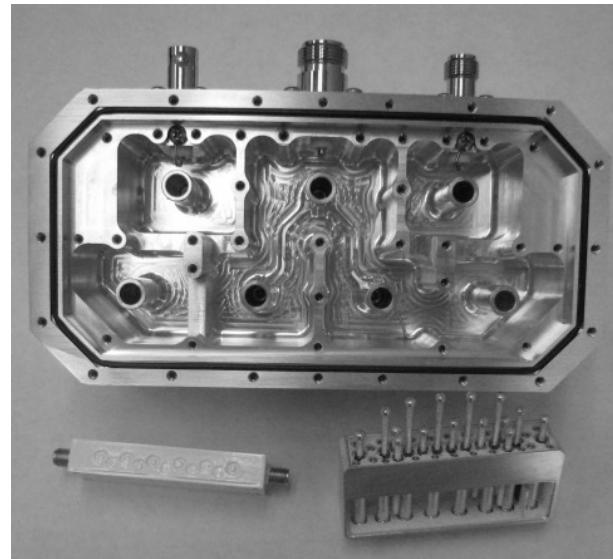
Target Price: _____ @ _____ (Qty) Production Date Required: _____ Quantity _____

UF Series

Microwave Filters

Product Line Features:

- Highly customized designs for optimum performance using state-of-the-art simulation software.
- Allows system optimization for performance size and weight.
- Fewer prototype iterations, faster development cycles.
- Adaptable manufacturing supports commercial, military, avionics and space applications.
- Laser hermetic packages for severe environments
- RoHS compliant when required.
- Available Design topologies
 - Dielectric Resonator
 - Cavity
 - Comline
 - Interdigital
 - Helical
 - Evanescent mode designs



Frequency (GHz)	Frequency	1 dB % BW	VSWR	Max. Temperature	# of Poles	Impedance (Ohms)
100 MHz - 15 GHz	100 MHz - 15 GHz	0.5% to Multi-Octave	1.1:1 or better	-55°C - +110°C	2-pole to 12-pole	50Ω typical

Dielectric Resonator Filters employ ceramic pucks as resonators and, with Q's in excess of 10,000 readily achievable; this technology is the choice for the narrowest bandwidth requirements. Dielectric resonator filters usually have bandwidths that range from less than 1% to 5%.

Cavity Filters employ conductive rods within conductive cavities as resonators. Apertures in the cavity walls permit coupling between resonators. Smaller apertures give narrower filters. Larger cavities have higher Q factors. Cavity filter bandwidths range from less than 3% to 20%.

Comline Filters are a close relative to cavity filters. In the Comline design the walls between adjacent cavities are completely removed and coupling between resonators is achieved by designing the correct spacing between resonators. These filters are commonly designed with all resonators in a straight line looking much like a comb. Comline filter bandwidths will range from 5% to 50%

Interdigital Filters are similar to Comline filters except the grounded end of alternate resonators is reversed. This arrangement gives the high inter-resonator coupling required for wide filter bandwidths. These filters have bandwidths up to nearly 100%.

Helical Filters are used at lower frequencies where resonator length becomes impractically long. The resonator, usually of one quarter wavelength, is coiled into a helix resulting in a much more compact design. Coupling between resonators is managed in the same manner as cavity or comline filters. Bandwidths from 1% to 30% can be achieved.

Evanescent Mode is used to describe resonators whose length is short, less than 30 degrees at the frequency of operation. Non-evanescent mode designs will use resonators between 45 and 80 degrees in length. The resultant resonator can be dramatically smaller but has lower Q and is typically more sensitive to manufacturing variations.

UF Series

Microwave Filters

F
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L
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E
R
S

Cavity Dual Band Reject Filter for LTE

I. GENERAL & ELECTRICAL REQUIREMENTS:

1. PASSBAND

Port C - ANT: 769.15MHz to 770.00MHz

ANT - Port B: 799.15MHz to 800.00MHz

2. PASSBAND INSERTION LOSS: 1.7dB typical, 2.0dB maximum

3. PASSBAND VSWR: 1.5:1 maximum

4. STOPBAND REJECTION

Port C - ANT (772MHz – 870MHz): 40dB minimum

ANT - Port B (772MHz – 776MHz): 40dB minimum

ANT - Port B (802MHz – 870MHz): 40dB minimum

5. PORT – PORT ISOLATION

Port C – Port B (769.15MHz – 770.00MHz): 70dB min

Port C – Port B (799.15MHz – 800.00MHz): 70dB min

6. POWER HANDLING: +37dBm minimum

7. ZIN/ZOUT: 50W nominal

II. ENVIRONMENTAL & PHYSICAL REQUIREMENTS:

1. ENVIRONMENTAL

Temperature

Operating: -20°C to +60°C

Storage: -40°C to +85°C

Shock: Per MIL-STD-810F, 516.5, Procedure I

Vibration: Per MIL-STD-810F, 514.5, Procedure I

Altitude: ≤ 10,000-ft

Humidity: Per MIL-STD-810F, 509.4, Procedure II

Rain: Per MIL-STD-810F, 506.4, Procedure II

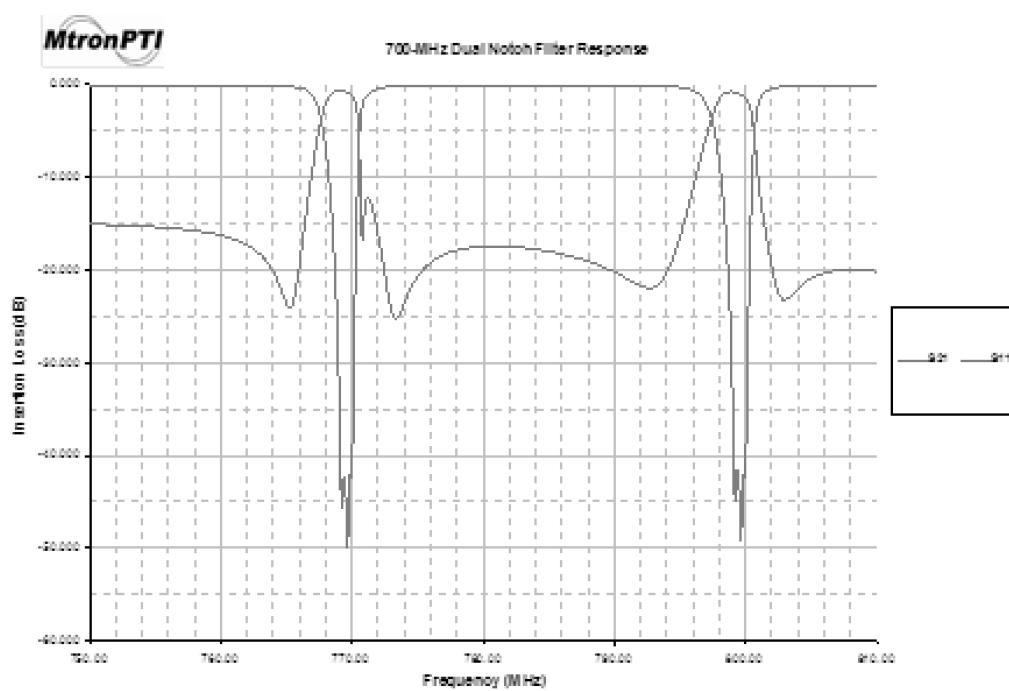
Sand & Dust: Per MIL-STD-810F, 510.4, Procedure I

2. PACKAGE

Dimensions (maximum, excluding connectors): 10.50" (L) x 9.50"

(W) x 2.88" (H)

I/O Connectors: N-Female (ANT), TNC-Female (Port B), BNC-Female (Port C)



Cavity Filter Diplexer for LTE

I. GENERAL & ELECTRICAL

REQUIREMENTS:

1. PASSBAND

Port C - ANT: 769.15MHz to 770.00MHz
ANT – Port B: 799.15MHz to 800.00MHz

2. PASSBAND INSERTION LOSS: 1.7dB typical, 2.0dB max

3. PASSBAND VSWR: 1.5:1 maximum

4. STOPBAND REJECTION

Port C – ANT (772MHz – 870MHz): 40dB minimum
ANT - Port B (772MHz – 776MHz): 40dB minimum

ANT - Port B (802MHz – 870MHz): 40dB minimum
minimum

5. PORT – PORT ISOLATION

Port C – Port B (769.15MHz – 770.00MHz): 70dB minimum

Port C – Port B (799.15MHz – 800.00MHz): 70dB minimum

6. POWER HANDLING: +37dBm minimum

7. ZIN/ZOUT: 50W nominal

II. ENVIRONMENTAL & PHYSICAL

REQUIREMENTS:

1. ENVIRONMENTAL

Temperature

Operating: -20°C to +60°C

Storage: -40°C to +85°C

Shock: Per MIL-STD-810F, 516.5, Procedure I

Vibration: Per MIL-STD-810F, 514.5,

Procedure I

Altitude: ≤ 10,000-ft

Humidity: Per MIL-STD-810F, 509.4,

Procedure II

Rain: Per MIL-STD-810F, 506.4, Procedure II

Sand & Dust: Per MIL-STD-810F, 510.4,

Procedure I

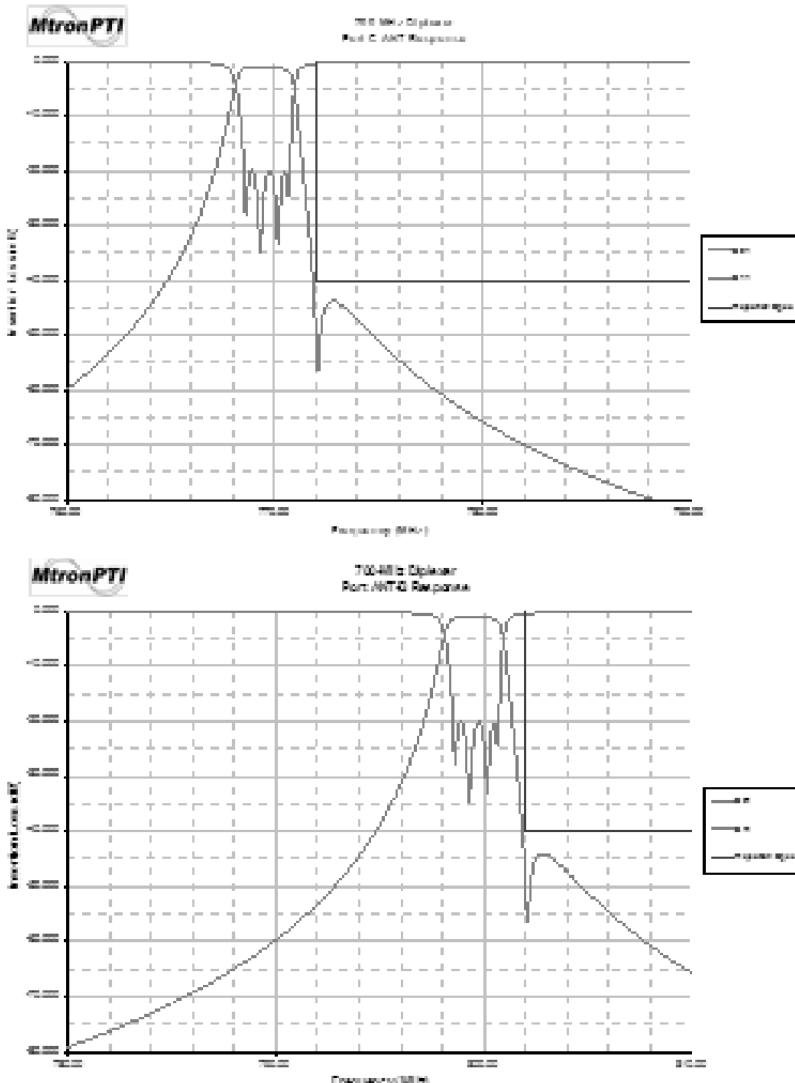
2. PACKAGE

Dimensions (maximum, excluding connectors):

10.50" (L) x 9.50" (W) x 2.88" (H)

I/O Connectors: N-Female (ANT), TNC-

Female (Port B), BNC-Female (Port C)



**Need Help in your Design?
Call us at
1-800-762-8800**

CF Series

Ceramic Filters, Diplexers & N-plexers



Product Line Features:

- Custom design capability
- Commercial and Military capabilities
- Discrete monoblock implementations
- Monoblock based filter assemblies
- RoHS compliant when required

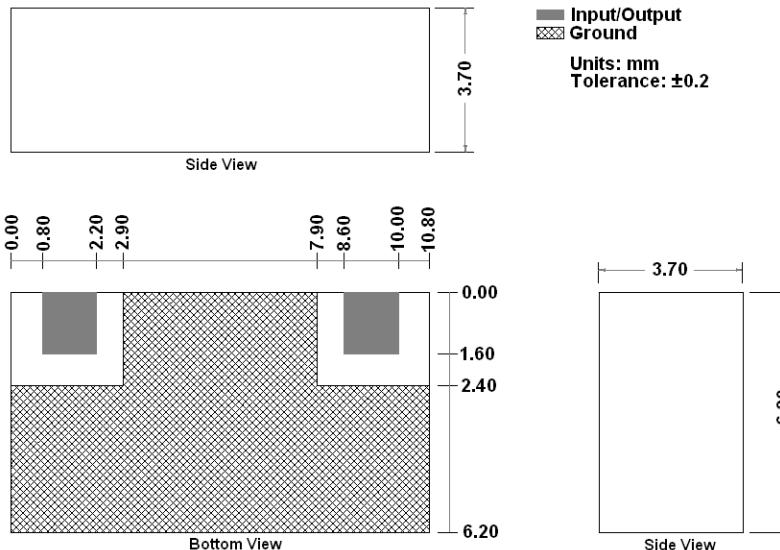


Frequency (GHz)	3 dB % BW	VSWR	Max. Temperature	# of Poles	Impedance (Ohms)
300 MHz - 5 GHz	0.5% - 40%	1.5:1 or better	-45°C - +85°C	2-pole to 8-pole	50Ω typical

Application Examples of Recent Custom Design Implementations

I. GENERAL & ELECTRICAL REQUIREMENTS

1. CENTER FREQUENCY (FON): 1815.0MHz typical
2. PASSBAND @ 1.5dB: 1780.0MHz to 1850.0MHz, minimum
3. INSERTION LOSS (1780.0MHz to 1850.0MHz): 1.5dB maximum
4. AMPLITUDE RIPPLE (peak-peak, 1780.0MHz to 1850.0MHz): 0.8dB maximum
5. RETURN LOSS (within 1780.0MHz to 1850.0MHz): 15.0dB minimum
6. ATTENUATION (minimum)
 - @ 1655.0MHz: 20dB minimum
 - @ 1315MHz: 40dB minimum
 - @ 1975MHz: 20dB minimum
 - @ 2315MHz: 40dB minimum
7. ULTIMATE ATTENUATION: 50dB minimum
8. MAXIMUM INPUT POWER: 1-Watt
9. ZS/ZL: 50W typical (single ended, no external matching required)



II. ENVIRONMENTAL & PHYSICAL REQUIREMENTS:

1. TEMPERATURE RANGE
 - Operating: -40°C to +70°C
 - Storage: -40°C to +85°C
2. PACKAGE: See Drawing
3. SOLDERABILITY: Per EIAJ-STD-002
4. FULL RoHS COMPLIANCE

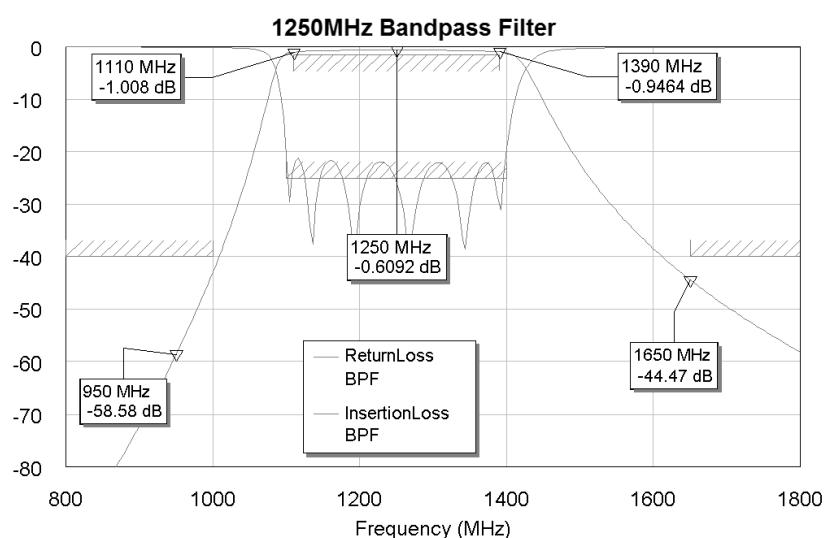
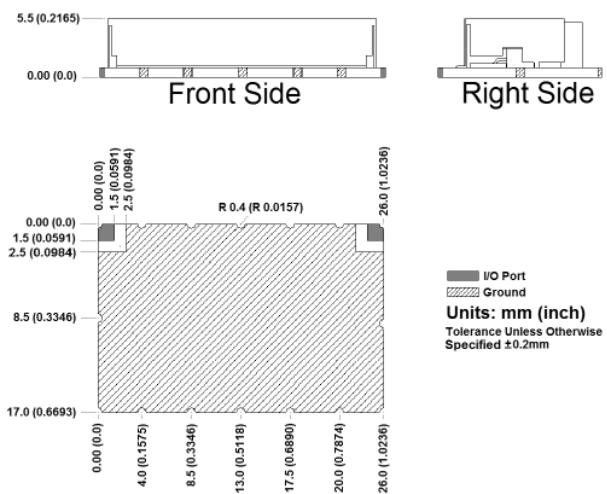
Application Examples of Recent Custom Design Implementations

I. GENERAL & ELECTRICAL REQUIREMENTS:

1. CENTER FREQUENCY (FON): 1250.0MHz
2. 1dB BANDWIDTH: 280MHz minimum (1110MHz to 1390MHz)
3. INSERTION LOSS (@ FON): $\leq 1.0\text{dB}$
4. AMPLITUDE RIPPLE (peak-valley, within 1110MHz to 1390MHz): $\leq 1.0\text{dB}$
5. INPUT/OUTPUT VSWR (within 1110MHz to 1390MHz): 1.5: 1 maximum
6. Attenuation (ref. to IL @ FON)
 - @ 900MHz (FON -350MHz): 60dB minimum
 - @ 950MHz (FON -300MHz): 40dB minimum
 - @ 1650MHz (FON +400MHz): 40dB minimum
 - @ 1850MHz (FON +600MHz): 60dB minimum
7. MAXIMUM INPUT POWER: $\leq +30\text{dBm}$
8. ZIN/ZOUT: 50W nominal

II. ENVIRONMENTAL & PHYSICAL REQUIREMENTS:

1. TEMPERATURE RANGE:
 - Operating: -40°C to $+85^\circ\text{C}$
 - Storage: -55°C to $+90^\circ\text{C}$
2. SHOCK: Per MIL-STD-810(G), Method 516.6, Procedure VI
3. VIBRATION: Per MIL-STD-810(G), Method 514.6, Category 9
4. ALTITUDE: Operational to 35,000 feet
5. PACKAGE: SMD: 26.0mm (L) x 17.0mm (W) x 5.5mm (H) (See Drawing)



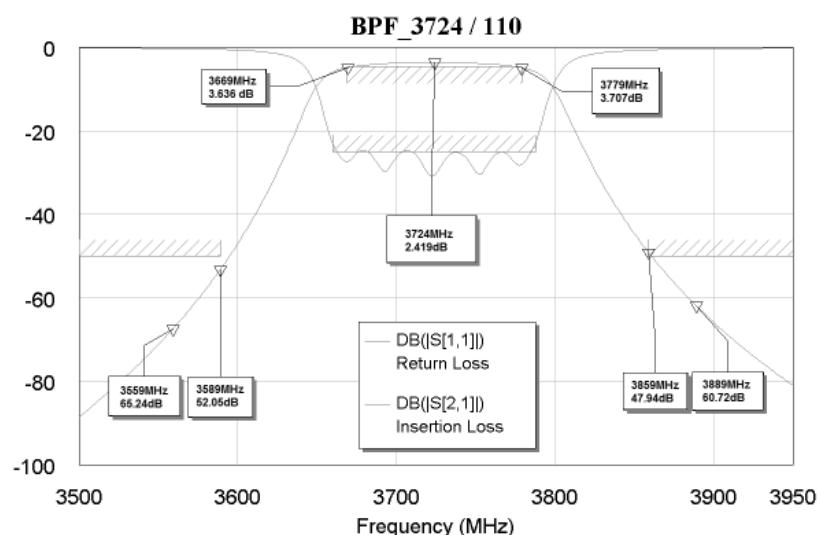
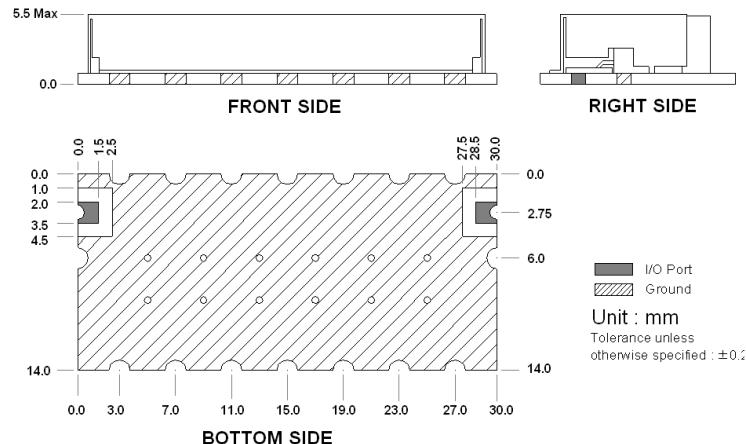
Application Examples of Recent Custom Design Implementations

I. GENERAL & ELECTRICAL REQUIREMENTS:

1. CENTER FREQUENCY (FON): 3724MHz
2. BANDWIDTH: FON \pm 55MHz minimum (3669MHz to 3779MHz)
3. INSERTION LOSS (@ peak of transmission within the passband): \leq 4.0dB
4. AMPLITUDE RIPPLE (peak-valley within the passband): \leq 1.5dB
5. RETURN LOSS (within the passband): 13dB minimum, 15db typical
6. GROUP DELAY VARIATION (over FON \pm 45MHz): 5.0 η sec typical, 10.0 η sec maximum
7. PHASE DISTORTION (over FON \pm 45MHz): \pm 15.0° typical, 25.0° maximum
8. ATTENUATION (ref. to IL)
 - 10MHz to 3559MHz: 60dB minimum
 - @3589MHz: 42dB minimum
 - @ 3889MHz: 42dB minimum
 - 3889MHz to 6000MHz: 55dB minimum
9. MAXIMUM INPUT POWER: \leq 1-Watt
10. ZIN/ZOUT: 50 Ω nominal

II. ENVIRONMENTAL & PHYSICAL REQUIREMENTS:

1. TEMPERATURE RANGE:
 - Operating: -40°C to +85°C
 - Storage: -55°C to +85°C
2. SHOCK: Per MIL-STD-202G, Method 202C
3. VIBRATION: Per MIL-STD-202G, Method 201A
4. HUMIDITY: Per MIL-STD-202, Method 103B, Test Condition A
5. ALTITUDE: Per MIL-STD-202G, Method 105C, Test Condition A
6. PACKAGE: SMD: See Figure 1



**Need Help in your Design?
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1-800-762-8800**

Product Line Features:

- Highly customized designs for optimum performance using state-of-the-art simulation software.
 - Allows system optimization for performance size and weight.
 - Fewer prototype iterations, faster development cycles.
- Adaptable manufacturing supports commercial, military, avionics and space applications.
- Laser hermetic packages for severe environments
- RoHS compliant when required.
- No pure tin assemblies available.
- Non-vented surface mount filters
 - Eliminates performance drift through water wash.
 - Low profile less than 0.200 inches for some applications.
- Low pass, high pass, Bandpass and notch filters available.
- Hybrid lumped element and distributed element microwave designs for applications requiring higher Q factors.



Frequency (GHz)	3 dB % BW	VSWR	# of Poles	Impedance (Ohms)
DC - 5 GHz	3% - 180%	1.5:1 or better	Optimized for Selectivity	50Ω typical

The following are some additional filter facts and guidelines based upon application type.

	Instrumentation	Industrial	Communications	HiRel Military	Space Qualified
Operating Temperature Range	0°C to +70°C	-20°C to +75°C	-30°C to +85°C	-55°C to +110°C	-55°C to +110°C
Packaging	Thru-Hole Wash Proof SMD Connectorized			Hermetic Thru Hole and SMD	
Input/Output Signal Power	To 500 Watt (Consult factory for specific high power requirements.)				
Shock/Vibration Operational & Survival	Meet Standard Industry Requirements			Consult the Factory for Specific Requirements	

Allow MtronPTI to work with you in developing your filter requirements. Our design staff, with many years of experience, will evaluate your requirements to give you honest and realistic estimates of achievable performance.

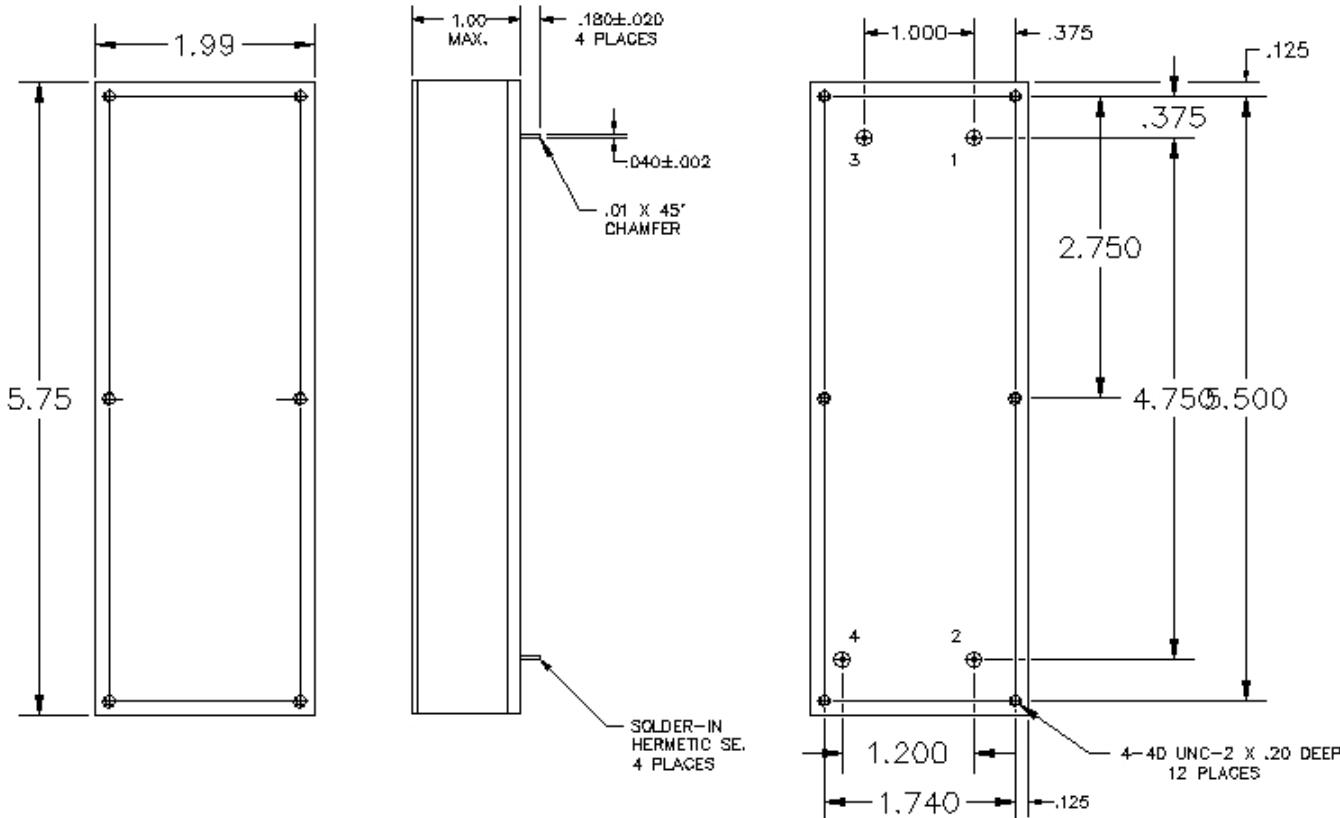
We promise to work our hardest, up front, to find the optimal compromise between performance, price, size and reliability for your application. We will provide you with the information you need to advance your design; cost estimates, performance plots, S2p data and packaging recommendations.

Applications Examples of Recent Custom Design Evaluations
I. GENERAL & ELECTRICAL REQUIREMENTS:

1. Center Frequency (FON):
 - Channel 1: 256MHz
 - Channel 2: 305MHz
2. 1dB Bandwidth:
 - Channel 1 28MHz minimum
 - Channel 2 26MHz minimum
3. Insertion Loss (@ FON): $\leq 1.0\text{dB}$
4. Amplitude Ripple (peak-valley, within each Passband): $\leq 0.5\text{dB}$
5. Return Loss : 20dB minimum
6. Attenuation (ref. to IL @ FON)
 - Channel 1: 256MHz
 - 35dB minimum: @ 225MHz
 - 35dB minimum: @ 289MHz
 - Channel 2: 305 MHz
 - 35dB minimum: 280MHz
 - 35dB minimum: 330MHz
7. Maximum Input Power: $\leq 50\text{-Watts}$
8. ZIN/ZOUT: 50Ω nominal

II. ENVIRONMENTAL & PHYSICAL REQUIREMENTS:

1. Temperature Range:
 - Operating: -40°C to $+85^\circ\text{C}$
 - Storage: -55°C to $+90^\circ\text{C}$
2. Shock: Per MIL-STD-810(G), Method 516.6, Procedure VI
3. Vibration: Per MIL-STD-810(G), Method 514.6, Category 9
4. Altitude: Operational to 35,000 feet
5. Package: (See Drawing)



Applications Examples of Recent Custom Design Evaluations

I. GENERAL & ELECTRICAL REQUIREMENTS:

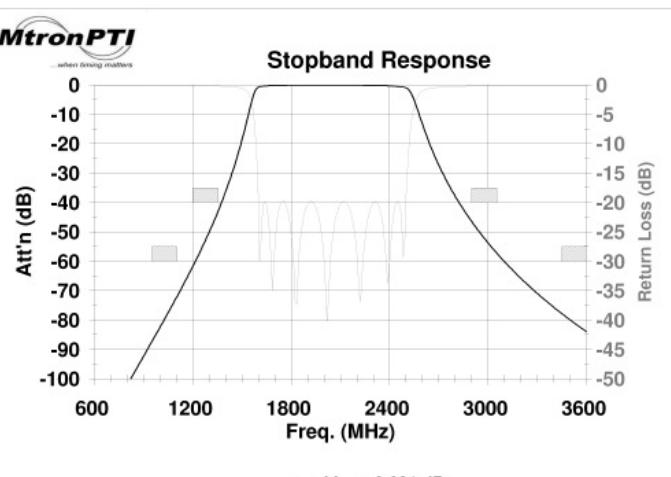
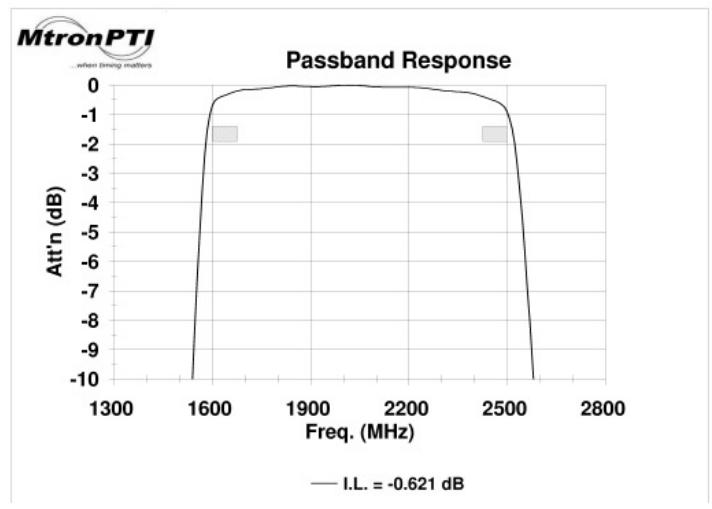
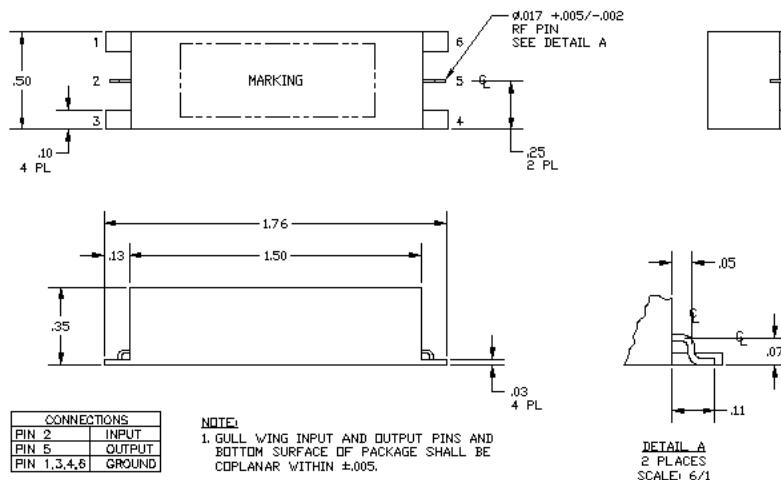
1. Center Frequency (FON): 2050MHz
2. 2dB Passband: 1600MHz to 2500MHz
3. Insertion Loss (@ peak of transmission within the passband): $\leq 2.0\text{dB}$
4. Passband Ripple (peak-valley): $\leq 0.5\text{dB}$
5. Return Loss: 15db minimum from 1600MHz to 2500MHz
6. Passband Group Delay Ripple: 8.0ns typical
7. Phase Distortion (over FON $\pm 45\text{MHz}$): $\pm 15.0^\circ$ typical, 25.0° maximum
8. Rejection (minimum, ref. to IL)
 - DC to 1100MHz: 60dB minimum
 - @ 1350MHz: 40dB minimum
 - @ 2900MHz: 40dB minimum
 - 3600MHz to 6000MHz: 60dB minimum
9. Maximum Input Power: $\leq 1\text{-Watt}$
10. ZIN/ZOUT: 50Ω nominal

9. Maximum Input Power: \leq 1-Watt

10. ZIN/ZOUT: 50Ω nominal

II. ENVIRONMENTAL & PHYSICAL REQUIREMENTS:

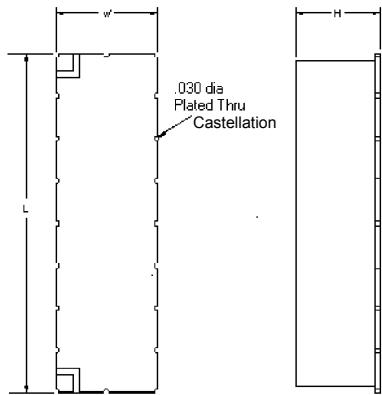
1. Temperature Range:
Operating: -40°C to +110°C
Storage: -55°C to +120°C
2. Shock: Per MIL-STD-202G, Method 213,
Condition C
3. Vibration: Per MIL-STD-202G, Method
201 & 204
4. Humidity: Per MIL-STD-202, Method
103B, Test Condition A
5. Package: SMD: See Figure 1



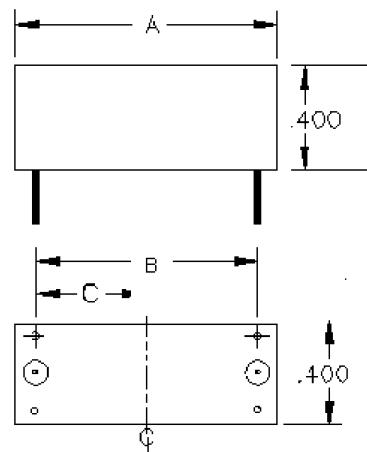
MtronPTI reserves the right to make changes to the product(s) and service(s) described herein without notice. No liability is assumed as a result of their use or application. Please see www.mtronpti.com for our complete offering and detailed datasheets. Contact us for your application specific requirements: MtronPTI **1-800-762-8800**.

Typical Package Configurations

True SMT (SM)



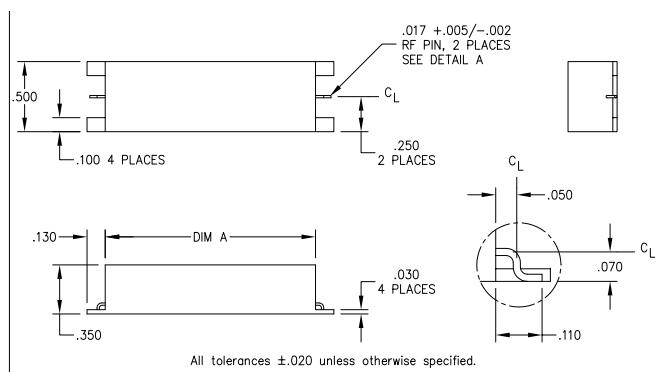
PC Mount (PC)



Dash #	L +/- .020	W +/- .020	H Max.
SM-001	0.370	0.370	0.350
-002	0.500	0.500	0.350
-003	0.750	0.500	0.350
-004	1.000	0.500	0.350
-005	1.250	0.500	0.350
-006	1.500	0.500	0.350
-007	2.000	0.600	0.500

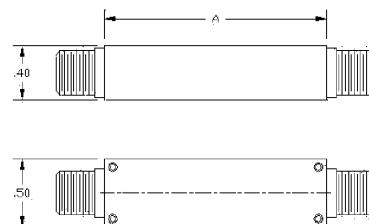
Dash #	L +/- .020	W +/- .020	H Max.
PC-001	0.750	0.600	0.300
-002	1.00	0.850	0.425
-003	1.500	1.350	0.675
-004	1.750	1.600	0.800

GW1



Family	DIM A
GW1-001	0.500
GW1-002	0.750
GW1-003	1.000
GW1-004	1.250
GW1-005	1.500
GW1-006	1.750

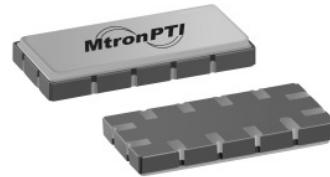
Connectorized (C)



Dash #	A
C-001	.750
-002	1.000
-003	1.500
-004	1.750

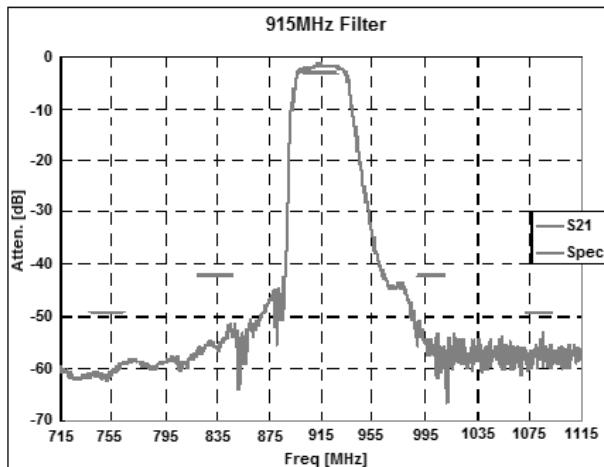
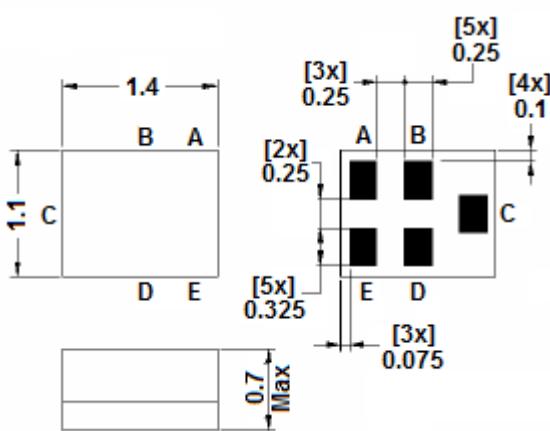
Product Line Features

- Custom design capability
- Commercial and Military capabilities
- IF and low loss RF design capabilities
- Ceramic SMD and all metal DIL thru-hole packages
- Lead or RoHS



Frequency (GHz)	3 dB % BW	Shape Factor	Insertion Loss	VSWR	Temperature	# of Poles	Impedance (Ohms)
20 MHz - 2.5 GHz	0.1% - 10%	1.1:1 and higher	1dB typical	1.1:1 or better	-45°C - +85°C	2-pole to 8-pole	50Ω typical

Application Examples of Recent Custom Design Implementations



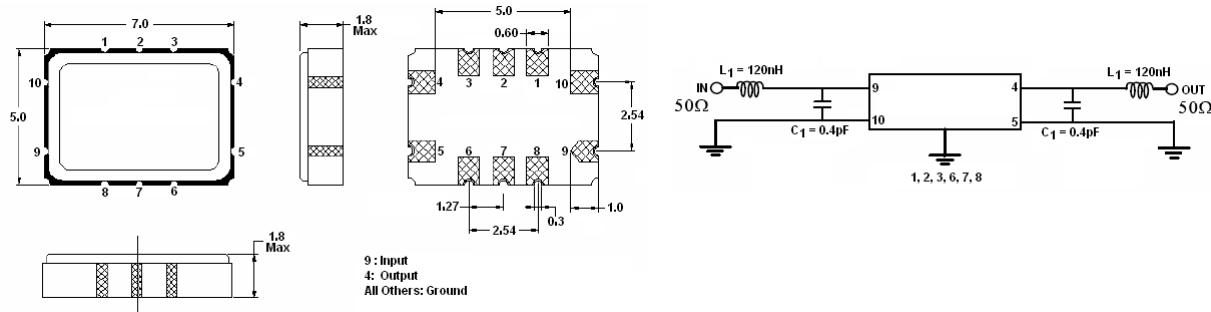
I. GENERAL & ELECTRICAL REQUIREMENTS:

1. CENTER FREQUENCY (FON): 915.00MHz typical
2. 3dB BANDWIDTH: 26.0MHz typical
3. INSERTION LOSS: 2.5dB typical, 3.1dB maximum
4. AMPLITUDE RIPPLE (peak-peak): 0.4dB typical, 1.5dB maximum
5. GROUP DELAY DEVIATION: 15nsec typical, 50nsec maximum
6. RETURN LOSS: 9dB minimum, 10dB typical
7. REJECTION (ref. to 0dB)
 - 0.1MHz to 702MHz: 50dB minimum, 53dB typical
 - 738MHz to 764MHz: 49dB minimum, 53dB typical
 - 820MHz to 846MHz: 42dB minimum, 48dB typical
 - 990MHz to 1010MHz: 42dB minimum, 50dB typical
 - 1072MHz to 1092MHz: 49dB minimum, 53dB typical
 - 1128MHz to 1804MHz: 40dB minimum, 42dB typical
 - 1804MHz to 1856MHz: 40dB minimum, 42dB typical
 - 1856MHz to 3000MHz: 30dB minimum, 36dB typical
8. INPUT POWER LEVEL: +10dB maximum
9. DC VOLTAGE: +3V maximum
10. ZS/ZL: 50Ω typical (no external matching required)

II. ENVIRONMENTAL & PHYSICAL REQUIREMENTS:

1. TEMPERATURE
 - Operating: -30°C to +85°C
 - Storage: -45°C to +90°C
2. PACKAGE 1.4mm x 1.1mm x 0.7mm (see drawing)
3. SOLDERABILITY: Per EIAJ-STD-002
4. FULL RoHS COMPLIANCE

Application Examples of Recent Custom Design Implementations

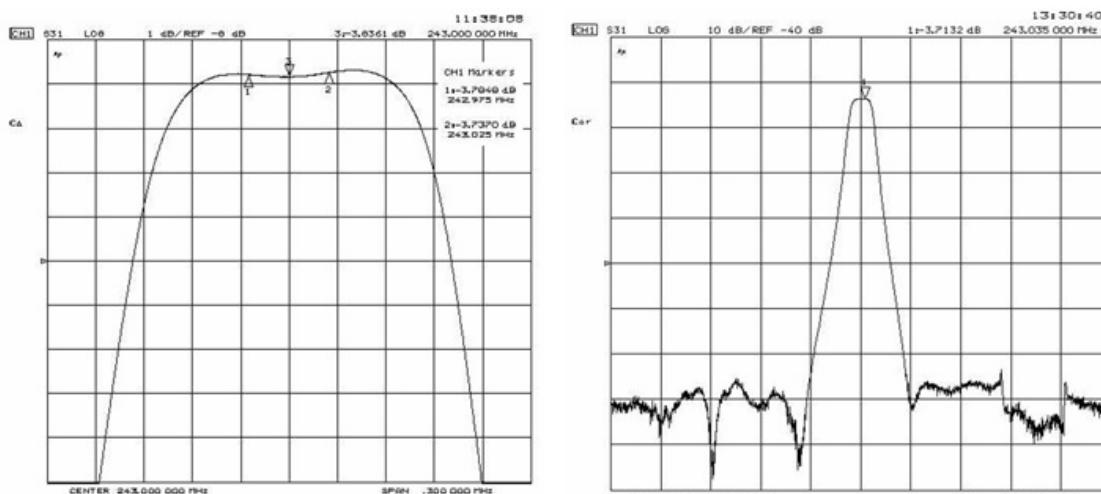


I. GENERAL & ELECTRICAL REQUIREMENTS:

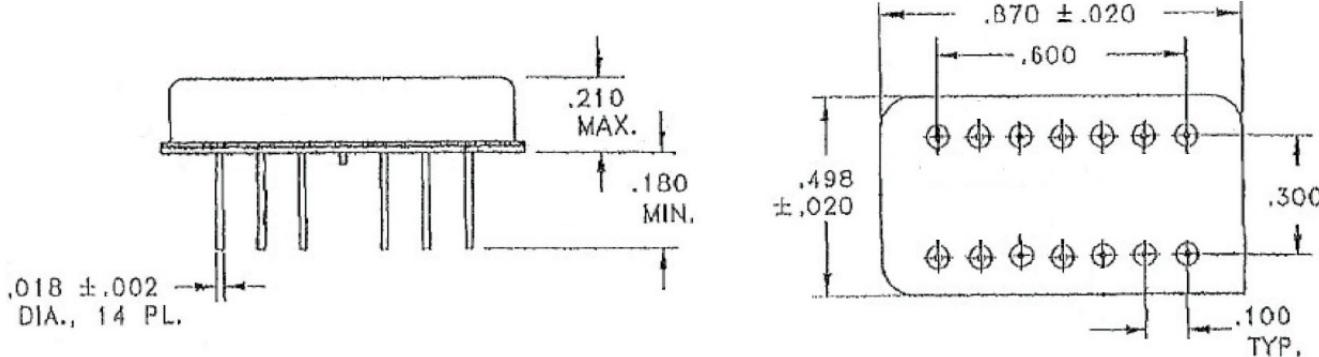
1. CENTER FREQUENCY (FON): 243.00MHz typical
2. PASSBAND: FON \pm 25.0MHz minimum
3. INSERTION LOSS (IL): 3.7dB typical, 6.0dB maximum
4. AMPLITUDE RIPPLE (peak-peak): 0.2dB typical, 1.0dB maximum
5. GROUP DELAY VARIATION: 0.5msec typical, 2.0msec maximum
6. ATTENUATION (ref. to minimum IL)
 - FON - 115.0MHz to FON - 1.0MHz: 50dB minimum, 63dB typical
 - FON - 1.0MHz to FON - 0.6MHz: 42dB minimum, 64dB typical
 - FON - 0.6MHz to FON - 0.4MHz: 29dB minimum, 68dB typical
 - FON + 0.4MHz to FON + 0.6MHz: 29dB minimum, 64dB typical
 - FON + 0.6MHz to FON + 1.0MHz: 42dB minimum, 63dB typical
 - FON + 1.0MHz to FON + 115MHz: 50dB minimum, 55dB typical
7. MAXIMUM INPUT POWER: +15dBm
8. ZIN/ZOUT: 50W typical (with external matching network applied)

II. ENVIRONMENTAL & PHYSICAL REQUIREMENTS:

1. TEMPERATURE RANGE
 - OPERATING: -40°C to +85°C
 - OPERATING: -45°C to +90°C
2. PACKAGE See Drawing
3. SOLDERABILITY: Per EIAJ-STD-002 (see Figure 1)
4. FULL RoHS COMPLIANCE



Application Examples of Recent Custom Design Implementations



I. GENERAL & ELECTRICAL REQUIREMENTS:

1. CENTER FREQUENCY (FON) @ 25°C:
408.875MHz minimum, 409.0MHz typical,
409.125MHz maximum
2. INSERTION LOSS (@ peak of transmission within
the passband): <12.0dB
3. AMPLITUDE RIPPLE (peak-peak, within the
passband): <0.75dB
4. BANDWIDTH
 - @ 1dB: >0.6MHz
 - @ 3dB: >1.0MHz
 - @40dB: <3.0MHz
5. PHASE LINEARITY (over 408.6MHz to
409.4MHz): <6°
6. GROUP DELAY VARIATION (over 408.6MHz to
409.4MHz): < 250hsec
7. STOPBAND REJECTION
 - Over 200.0MHz to 369.0MHz: > 50dB
 - Over 449.0MHz to 600.0MHz: > 50dB
8. AMBIENT TEMPERATURE: 25°C typical
9. MAXIMUM INPUT SIGNAL POWER: +10dBm
10. ZS/ZL: 50Ω nominal

II. ENVIRONMENTAL & PHYSICAL REQUIREMENTS:

1. OPERATING TEMPERATURE RANGE: -40°C to
+80°C
2. VIBRATION
 - Random Vibration
 - Band: 20 to 2000Hz
 - Level: 30geff, s = 3
 - Duration: 3-minutes per axe
 - One try by axe: 3-axes
 - Long Term Random Vibration
 - Level: 5.3geff
 - Duration: 2-hours 30-minutes per axe – 3 axes
3. ACCELERATION
 - Level: 100g
 - Duration: 3-minutes by direction 3 axes – 6
directions
4. HYGROSCOPY (HUMIDITY)
 - Temperature: +40°C
 - Humidity: 93% ±2%
 - Duration: 10-hours
5. THERMAL SHOCK
 - The filter is placed in a confined room at 60°C during
5-hours then placed in another confined room at 150°C
during 3-min. Control are made during the thermal
shock: transmission curve

**Need Help in your Design?
Call us at
1-800-762-8800**

Product Line Features

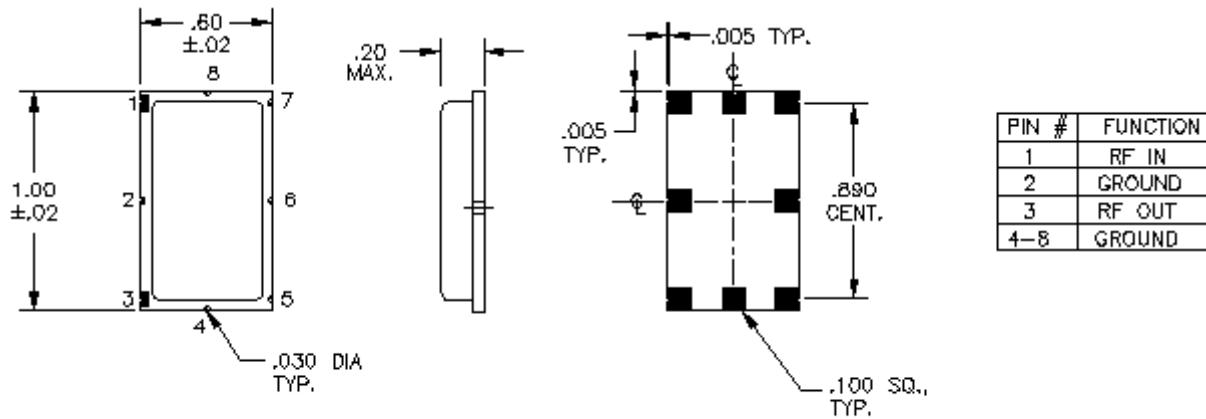
- Custom design capability
- Commercial, Military and Space capabilities
- Monolithic and Discrete design capability
- Wash proof for surface mount applications
- Lead or RoHS
- No pure tin available upon request

Type	Frequency (MHz)	3 dB % BW	Shape Factor	Insertion Loss	VSWR	Max. Temperature	# of Poles	Impedance (Ohms)
Discrete	5 - 250	0.01% - 2%	1.5:1 or better	1.5 dB for 2-pole	1.5:1 or better	-45°C - +85°C	2-pole to 12-pole	50Ω typical
Monolithic	5 - 200	0.014% - 0.5%	2:1 or better	1.5 dB for 2-pole	1.5:1 or better	-45°C - +85°C	2-pole to 12-pole	50Ω typical

The following are some additional filter facts and guidelines based upon application type.

	Instrumentation	Industrial	Communications	HiRel Military	Space Qualified
Operating Temperature Range	0°C to +70°C	-20°C to +75°C	-30°C to +85°C	-55°C to +110°C	-55°C to +110°C
Packaging	Thru-Hole Wash Proof SMD Connectorized				
Input/Output Signal Power	<+15dBm (Consult factory for specific requirements.)				
Shock/Vibration Operational & Survival	Meet Standard Industry Requirements			Consult the Factory for Specific Requirements	

Allow MtonPTI to work with you in developing your filter requirements. Our design staff of many years' experience will evaluate your requirements and give you realistic estimates of achievable performance. We will work our hardest to find the optimal compromise between performance, price, size and reliability for your application. We will provide you with the information you need to advance your design; cost estimates, performance plots, S2p data and packaging recommendations.

Application Examples of Recent Custom Design Implementations


ALL DIMENSIONS ARE IN INCHES

PIN NUMBERS ARE FOR ILLUSTRATION PURPOSES ONLY. THEY DO NOT APPEAR ON THE DEVICE

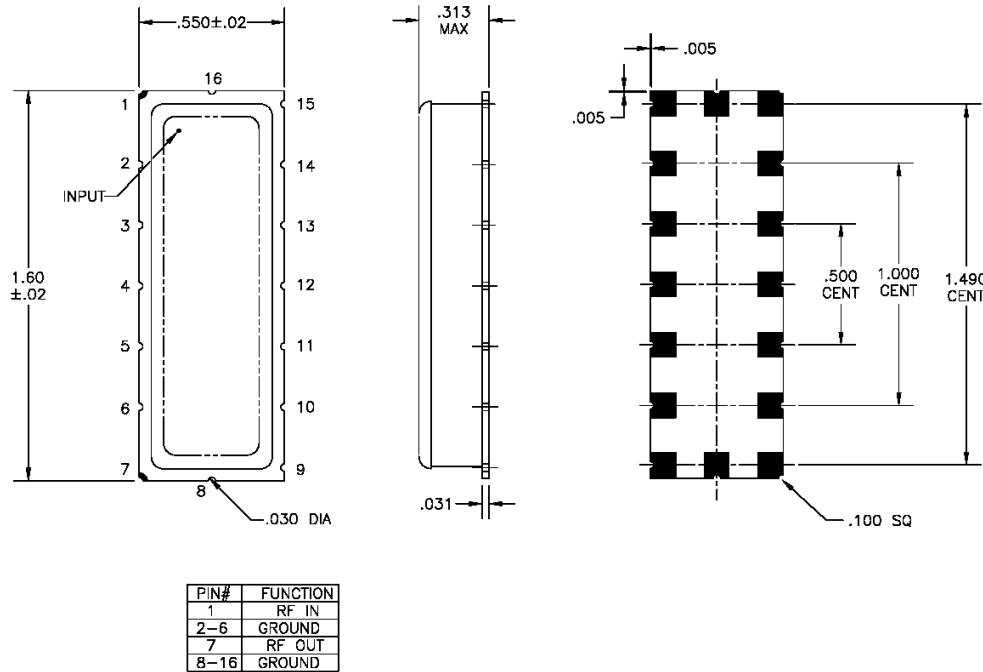
I. GENERAL & ELECTRICAL REQUIREMENTS

1. Center Frequency (FON): 76.0MHz
2. Passband @ 1.5dB: FON ±25.0kHz minimum
3. Insertion Loss (@FON): ≤ 4.0dB
4. Passband Ripple (peak-valley, FON ±25.0kHz): < 1.5dB
5. Stopband Attenuation (Relative to Insertion Loss)
 - FON -50MHz to FON -1MHz: ≥ 50dB
 - FON -1MHz to FON -500kHz: ≥ 40dB
 - FON -500kHz to FON -100kHz: ≥ 15dB
 - FON +100kHz to FON +500kHz: ≥ 15dB
 - FON +500kHz to FON +2.5MHz: ≥ 35dB
 - FON +2.5MHz to FON +3.5MHz: ≥ 45dB
 - FON +3.5MHz to FON +75MHz: ≥ 50dB
6. Terminating Impedance (ZS/Z/L): 50W nominal

II. ENVIRONMENTAL & PHYSICAL REQUIREMENTS:

1. Temperature Range
 - Operating: -55°C to +85°C
 - Storage: -55°C to +90°C
2. Solderability: Per EIAJ-STD-002
3. Package: SMD (see drawing)

Application Examples of Recent Custom Design Implementations



I. GENERAL & ELECTRICAL REQUIREMENTS

1. Center Frequency (FON): 112.5MHz
2. Passband @ 1.0dB: FON ±10.0kHz minimum
3. Insertion Loss (@ peak of transmission, within the Passband): ≤ 4.5dB
4. Passband Ripple (peak-valley, within the Passband): < 0.75dB
5. Input/Output VSWR (within FON ±10.0kHz): 2.2:1 maximum
6. Differential Group Delay (FON ±10.0kHz): ≤8μsec
7. Stopband Attenuation (minimum relative to Insertion Loss)
 - 13dB: FON ±50kHz maximum
 - 28dB: FON ±100kHz maximum
 - 44dB: FON ±400kHz maximum
8. Spurious Responses: -28dB maximum, FON +100kHz to FON +400kHz
9. Power Handing
 - Operating (full specifications compliance): +7dBm
 - Without Damage (non-specification compliant): +18dBm
10. In-band Intermodulation: -50dB maximum, Two (2) -3.5dBm Test Tones @ FON ±500.0kHz
11. Terminating Impedance (ZS/Z/L): 50W nominal

II. ENVIRONMENTAL & PHYSICAL REQUIREMENTS:

1. Temperature Range
 - Operating: -55°C to +85°C
 - Storage: -55°C to +90°C
2. Solderability: Per EIAJ-STD-002
3. Package: SMD (see drawing)

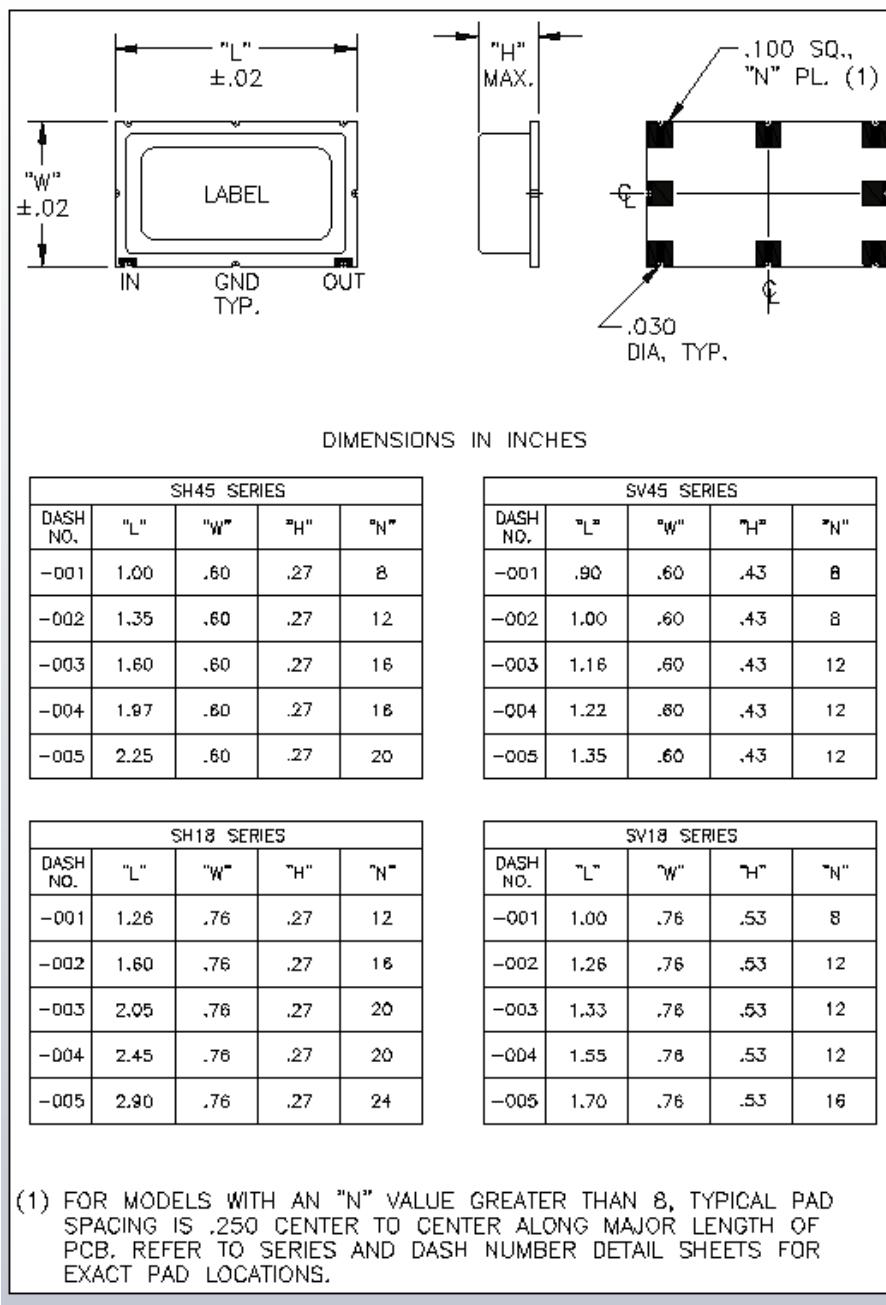
XF Series

Crystal Filters (Discrete and Monolithic)

All package styles except for vented surface mount are hermetic and are available in standard or customized versions. Styles include:

- Through hole printed circuit
- Connectorized
- Stud mount or insert mount
- Gull wing surface mount
- Vented surface mount

The following is an example of MtronPTI's standard SMD packages suitable for all commercial, industrial and most military applications.



GPSDO Selection Guide

Package Size	Supply Voltage	Frequency Range	Family	Type	Page Number
1 x 1 inch	3.3 Volt	10 - 10 MHz	M9107	GPSDO	
1 x 1 inch	3.3 Volt	10 - 10 Mhz	M9108	GPSDO	
1 x 2.5 inch	12 Volt	10 - 10 MHz	M9100	GPSDO	
1.5 x 3 inch	12 Volt	5 - 20 MHz	M9101	GPSDO	
1.5 x 3 inch	12 Volt	10 - 10 MHz	M9103	GPSDO	

M9107 Series

1 x 1 x 0.5 inches, SMT OCXO-Based GPSDO (Global Positioning Satellite Disciplined Oscillator)

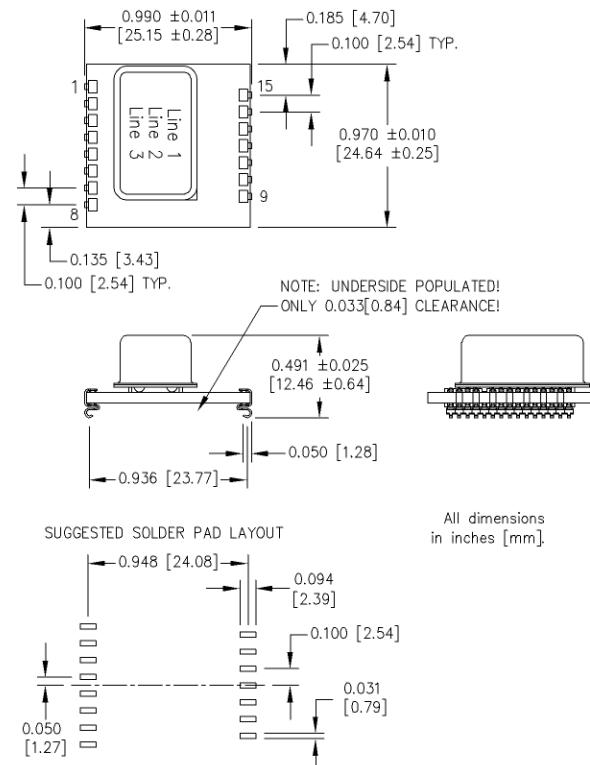


- Small, SMT configuration
- Direct mounting to PCB - eliminates need for expensive connectors and wiring harnesses
- Ideal for precise timing or locating applications such as test equipment, base stations, network timing and military programs
- Compact size - less than 1" x 1"

Pin Connections	
Function	Pin
Ground	1
10 MHz Out	2
Lock OK	3
1PPS Output	4
1PPS Input	5
+5V Output	6
Ground	7
+3.3V VDO In	8
Ground	9
Antenna Input	10
Ground	11
NMEA Transmit	12
/Enter ISP	13
Serial Input	14
Serial Output	15

Marking:

Line 1: Part Number
 Line 2: MTRONPTI
 Line 3: • Date Code



Module Specifications (Typical):	M9107										
1 PPS Accuracy	±40ns to UTC RMS (1-Sigma) GPS Locked (no motion, stable temperature, still air)										
Holdover Stability	<±11us over 3 Hour Period @+25°C (No Motion, Still air)										
1 PPS Output (OCXO Flywheel Generated)	3.3VDC CMOS										
RS-232 Control	SCPI-99 TTL levels GPS NMEA Out										
GPS Frequency	L1, C/A 1574MHz										
GPS Antenna	Active or Passive										
GPS Receiver	50 Channels, Mobile, WAAS, EGNOS, MSAS capable										
Sensitivity	Acquisition -142 dBm, Tracking -158 dBm										
TTFF	Cold Start - <45 sec, Warm Start - 1 sec, Hot Start - 1 sec										
ADEV	1E-11 (Tau=1s), <5E-12 (Tau=10,000s)										
TTL Alarm Output	GPS Unlock and Hardware Failure, and LOCK indicators										
Warm Up Time / Stabilization Time	<5 min at +25°C to 1E-08 Accuracy										
Supply Voltage (Vdd)	3.3 V Single Supply (5V internally generated)										
Power Consumption	0.7W Typical										
Operating Temperature	-20°C to +70°C										
Storage Temperature	-45°C to +85°C										
Additional Features	Firmware field-upgradable, external 1PPS input, status LEDs, compatible to GPSCon, SNTP, GPSD, and Z38xx software applications, full NMEA										
Oscillator Specification:											
Frequency Output	10MHz										
10MHz Retrace	±2E-08 After 1 Hour										
Frequency Stability Over Temperature (Unlock Condition)	100ppb pk-pk										
Output Amplitude	5.0V CMOS										
Warm Up Time	< 1 min @ +25°C										
Phase Noise	<table border="1"> <tr> <td>1Hz</td><td>-80dBc/Hz</td></tr> <tr> <td>10Hz</td><td>-110dBc/Hz</td></tr> <tr> <td>100Hz</td><td>-135dBc/Hz</td></tr> <tr> <td>1kHz</td><td>-145dBc/Hz</td></tr> <tr> <td>10kHz</td><td><145dBc/Hz</td></tr> </table>	1Hz	-80dBc/Hz	10Hz	-110dBc/Hz	100Hz	-135dBc/Hz	1kHz	-145dBc/Hz	10kHz	<145dBc/Hz
1Hz	-80dBc/Hz										
10Hz	-110dBc/Hz										
100Hz	-135dBc/Hz										
1kHz	-145dBc/Hz										
10kHz	<145dBc/Hz										

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M9108 Series

1 x 1 inches, SMT TCXO-Based GPSDO

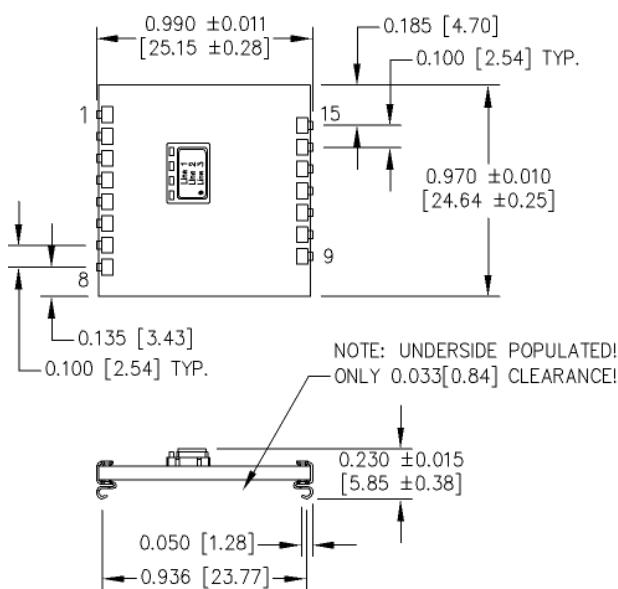
(Global Positioning Satellite Disciplined Oscillator)



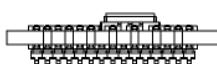
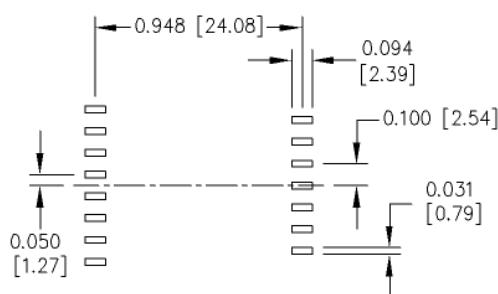
- **Fast Warm-Up Time**
- **Extremely Low Power**
- **Small, SMT configuration**
- **Direct mounting to PCB - eliminates need for expensive connectors and wiring harnesses**
- **Ideal for precise timing or locating applications such as test equipment, base stations, network timing and military programs**
- **Compact size - less than 1" x 1", low profile version available**

Module Specifications (Typical):		M9108
1 PPS Accuracy		±50ns to UTC RMS (1-Sigma) GPS Locked (No motion, stable temperature, still air)
Holdover Stability		<±11us over 3 Hour Period @+25°C (No Motion, Still air)
1 PPS Output (OCXO Flywheel Generated)		3.3VDC CMOS
RS-232 Control		SCPI-99 TTL levels GPS NMEA Out
GPS Frequency		L1, C/A 1574MHz
GPS Antenna		Active or Passive
GPS Receiver		50 Channels, Mobile, WAAS, EGNOS, MSAS capable
Sensitivity		Acquisition -142 dBm, Tracking -158 dBm
TTFF		Cold Start - <45 sec, Warm Start - 1 sec, Hot Start - 1 sec
ADEV		3E-10 (Tau=1s), <9E-12 (Tau-10,000s)
TTL Alarm Output		GPS Unlock and Hardware Failure, and LOCK indicators
Warm Up Time / Stabilization Time		<5 min at +25°C to 1E-08 Accuracy
Supply Voltage (Vdd)		3.3 V Single Supply (5V internally generated)
Power Consumption		0.7W Typical
Operating Temperature		-20°C to +70°C
Storage Temperature		-45°C to +85°C
Additional Features		Firmware field-upgradable, external 1PPS input, status LEDs, compatible to GPSCon, SNTP, GPSD, and Z38xx software applications, full NMEA
Oscillator Specification:		
Frequency Output		10MHz
10MHz Retrace		±2E-08 After 1 Hour
Frequency Stability Over Temperature (Unlock Condition)		100ppb pk-pk
Output Amplitude		5.0V CMOS
Warm Up Time		< 1 min @ +25°C
Phase Noise	1Hz	-80dBc/Hz
	10Hz	-110dBc/Hz
	100Hz	-135dBc/Hz
	1kHz	-145dBc/Hz
	10kHz	<-145dBc/Hz

M9108L
Low Profile

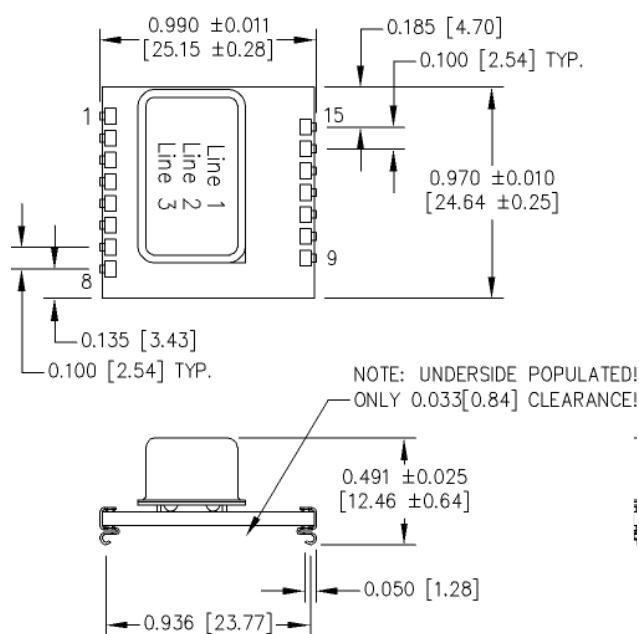


SUGGESTED SOLDER PAD LAYOUT

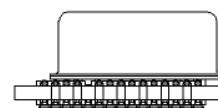
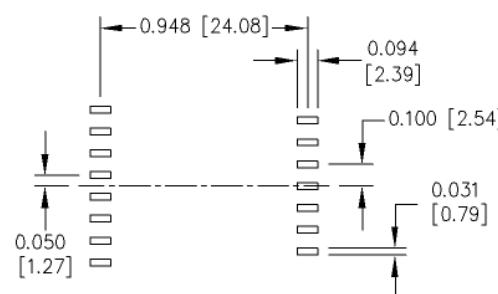


All dimensions
in inches [mm].

M9108D
DIP



SUGGESTED SOLDER PAD LAYOUT



All dimensions
in inches [mm].

M9100 Series
1 x 2.5 x 0.5 inch GPSDO
(Global Positioning Satellite Disciplined Oscillator)



- **1 x 2.5 x 0.5 Inch Package**
- **< 1 Minute OCXO Warm Up**
- **50 Channel WAAS GPS Receiver**
- **Very low power (1.35 W typ.)**
- **Applications: Fixed/Mobile Communications, Man-Pack Radios, Smart Weapons**

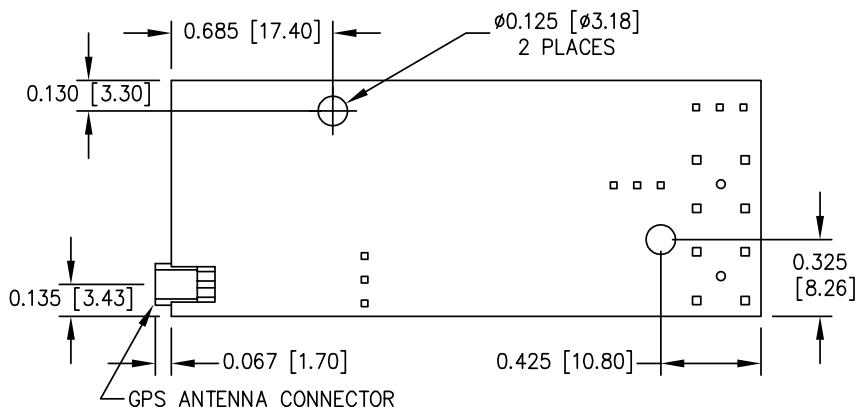
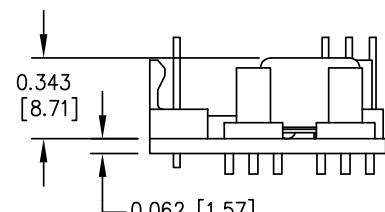
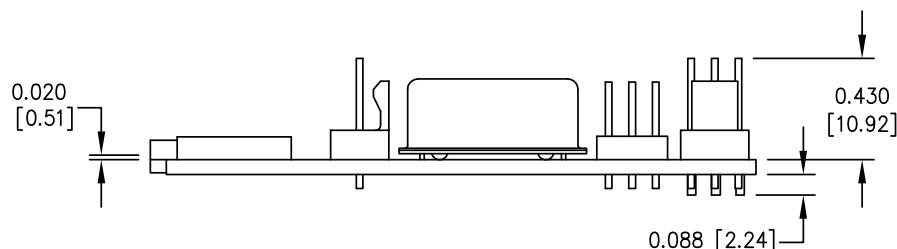
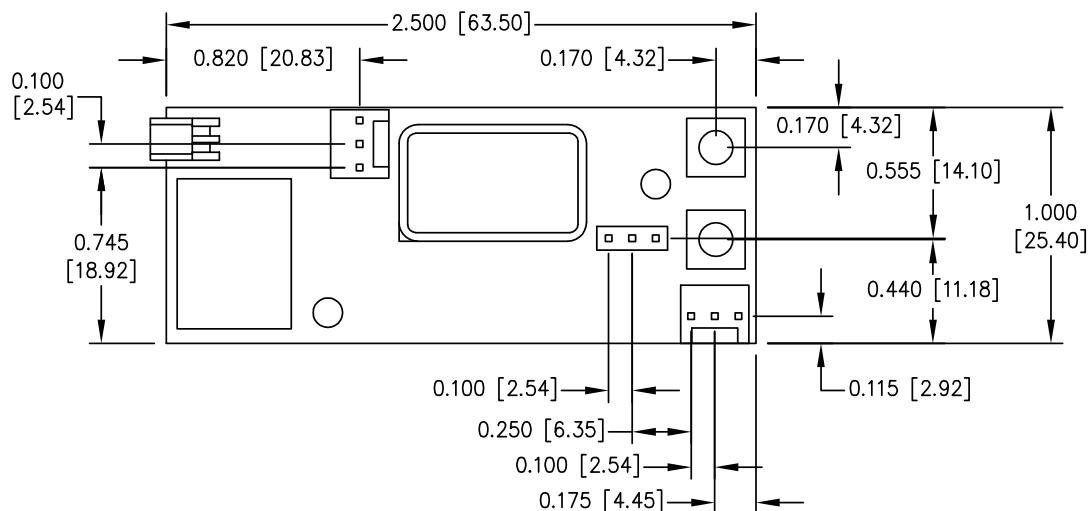
Module Specification (Typical):		M9100	
1 PPS Accuracy		±40ns to UTC RMS (1-Sigma) GPS Locked (no motion, stable temperature, still air)	
Holdover Stability		<±11us over 3 Hour Period @+25°C (No Motion)	
1 PPS Output		3.3VDC CMOS Compatible	
RS-232 Control		SCPI-99 Control Commands 1PPS Level Output for Linux SNTP Server Software (with D Sub RTS pin)	
GPS Frequency		L1, C/A 1574MHz (Gallileo supported when available)	
GPS Antenna		Active or Passive	
GPS Receiver		50 Channels, Mobile, WAAS, EGNOS, MSAS capable	
Sensitivity		Acquisition -144 dBm, Tracking -160 dBm	
TTFF		Cold Start - <45 sec, Warm Start - 1 sec, Hot Start - 1 sec	
ADEV		2 E-011/1s	
TTL Alarm Output		GPS Unlock and Hardware Failure, and LOCK indicators	
Warm Up Time / Stabilization Time		<5 min at +25°C to 1E-08 Accuracy	
Supply Voltage (Vdd)		+7.5 to 14.0 VDC±5% (12 VDC Nominal)	
Power Consumption		<1.8W Max, 1.35W Typ.	
Operating Temperature		0°C to +60°C	
Storage Temperature		-45°C to +85°C	
Oscillator Specification:			
Frequency Output		10MHz	
Retrace		±2E-08 After 1 Hour	
Frequency Stability Over Temperature (Unlock Condition)		±2.5E-08	
Output Amplitude		+13dBm ± 3dBm <i>(Refer to user manual for pin out information)</i>	
OCXO Warm Up Time		< 1 min	
Phase Noise		1Hz	-80dBc/Hz
		10Hz	-110dBc/Hz
		100Hz	-135dBc/Hz
		1kHz	-145dBc/Hz
		10kHz	<-145dBc/Hz
Connections:		Connector Type:	
1PPS Output, 10MHz Output		SMB	
RS-232		3 Pin	

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M9100 Series
1 x 2.5 x 0.5 inch GPSDO
(Global Positioning Satellite Disciplined Oscillator)



**G
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All dimensions
in inches [mm].

M9101 Series

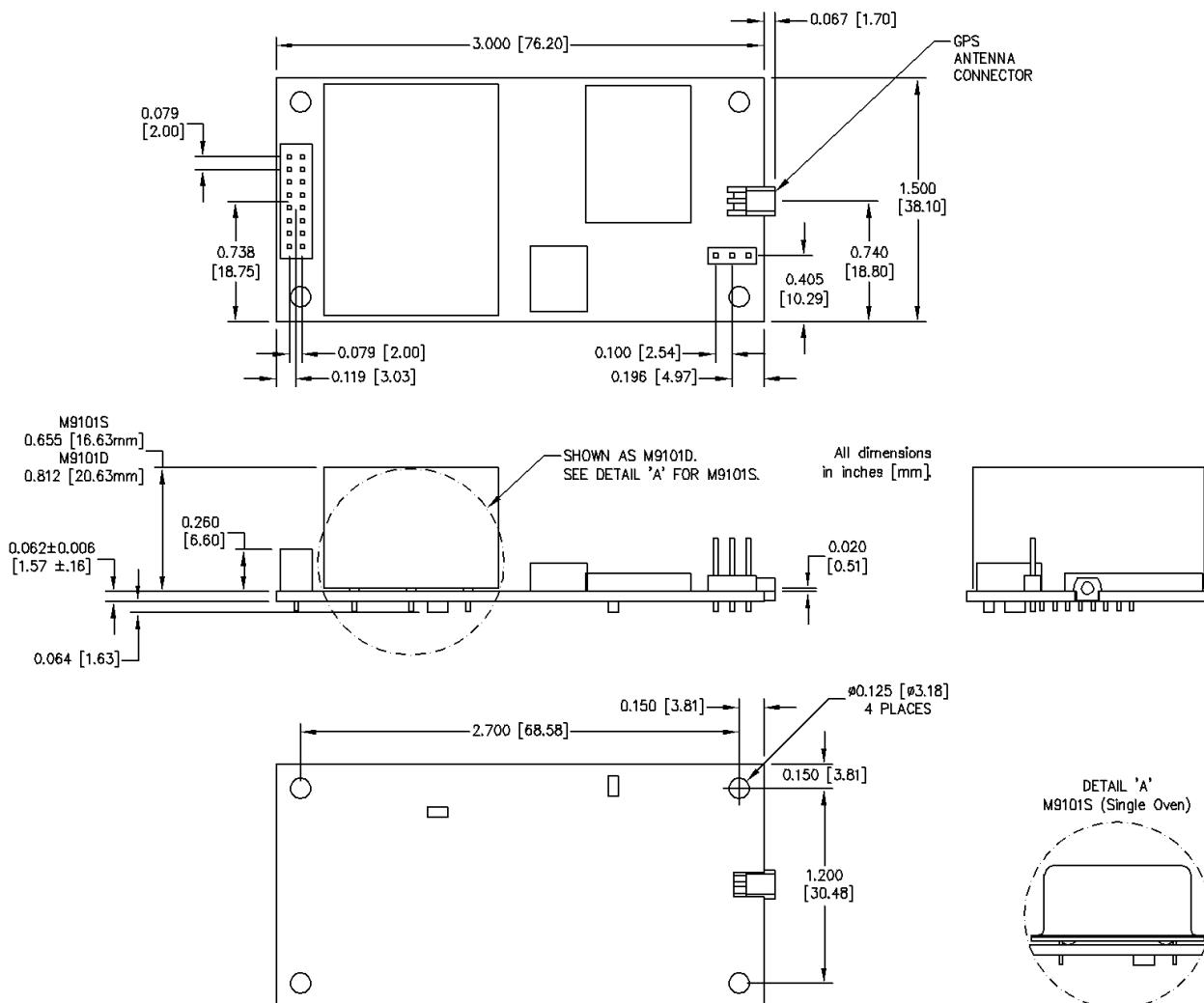
1.5 x 3.0 x 0.8 inches, GPSDO

(Global Positioning Satellite Disciplined Oscillator)

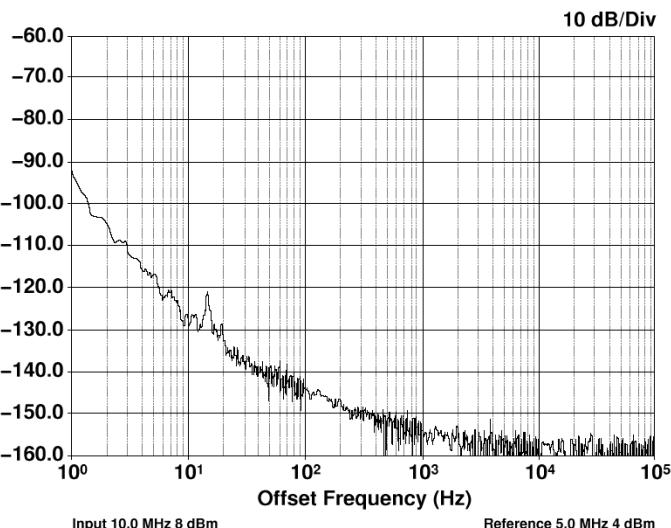


- **M9101S (Single Oven)**
- **M9101D (Double Oven)**
- **1.5 x 3.0 x 0.8 Inch Package**
- **Excellent Holdover Stability**
- **Ruggedized Military Low G-Sensitivity Option Available**
- **Applications: Master Clock & Receiver for CDMA, WiMAX & GSM Basestations, SATCOM, Precision Time Base Reference (1PPS), and Navigation Systems**

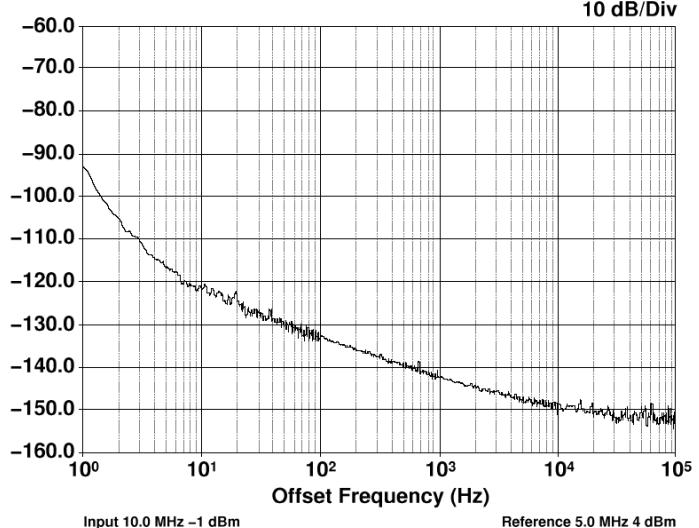
Module Specification (Typical):	M9101S (Single Oven Version)	M9101D (Double Oven Version)
1 PPS Accuracy	±25ns to UTC RMS (1-Sigma) GPS Locked (no motion, stable temperature, still air)	±15ns to UTC RMS (1-Sigma) GPS Locked (no motion, stable temperature, still air)
Holdover Stability (After 3 day of lock to GPS)	< ± 50 µs over 24 hr. period @ +25°C	< ± 7 µs over 24 hr. period @ +25°C
1 PPS Output	LVDS compatible	
10 MHz Output	LVDS and HCMOS compatible	
RS-232 Control	RS-232 Levels. SCPI-99 Control Commands 1 PPS output level for Linux SNTP Server Software with D Sub RTS pin.	
GPS Frequency	L1, C/A 1574 MHz (Galileo supported when available)	
GPS Antenna	Active or Passive Type	
GPS Receiver	50 channels, Mobile, WAAS, EGNOS, MSAS, capable	
GPS Receiver Sensitivity	Acquisition -144 dBm, tracking -160 dBm	
TTFF	Cold Start: < 45 sec	
	Warm Start: 1 sec.	
	Hot Start: 1 sec	
ADEV	< 1 E -011/1 sec.	< 4 E -012/1 sec.
TTL Alarm Output	GPS Unlock and Hardware Failure Status	
OCXO Warm-Up Time/Stabilization Time	< 12 min. at +25°C for 1 E-09 accuracy.	
GPSDO Lock Time to <5E-010 accuracy	<1Hr	<30 min.
Supply Voltage	12.0 VDC ± 5%	
Power Consumption	< 2.5 W at 12 V and +25°C	< 4.0 W at 12 V and +25°C
Operating Temperature	0°C to +60°C	0°C to +75°C
Storage Temperature	-45°C to +85°C	
OCXO Specification:		
Output Frequency	10 MHz (Other frequencies 5-20 MHz available)	
Retrace	± 2 E-08 after 1 hr.	
Frequency Stability Over Operating Temperature	± 2.5 E -8 (Unlocked Condition)	± 2.5 E -10 (Unlocked Condition)
Output Amplitude	5 V HCMOS, LVDS ± 30 mV differential (Refer to user manual for pin out information)	
OCXO Retrace time	< 3Hrs	< 1Hr
Phase Noise	1 Hz -85 dBc/Hz	1 Hz -90 dBc/Hz
	10 Hz -115 dBc/Hz	10 Hz -120 dBc/Hz
	100 Hz -140 dBc/Hz	100 Hz -140 dBc/Hz
	1 kHz -150 dBc/Hz	1 kHz -150 dBc/Hz
	10 kHz -158 dBc/Hz	10 kHz -158 dBc/Hz
CONNECTIONS:		
1 PPS Output, 10 MHz Output, RS-232 Control	16 pin double row header with 2 mm pin spacing	



Phase Noise Plot - M9101S (Single Oven)



Phase Noise Plot - M9101D (Double Oven)



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M9103 Series

1.5 x 3.0 x 0.8 inches, GPSDO (Global Positioning Satellite Disciplined Oscillator) With 3-Port Distribution Amplifier



- **1.5 x 3.0 x 0.8 Inch Package**
- **Built-in 10 MHz Distribution Amplifier with 3 Isolated Sinewave Outputs**
- **Excellent Holdover Stability**
- **Double OCXO with SC-Cut Crystal**
- **Applications Requiring Multiple Outputs: Master Clock & Receiver for CDMA, WiMAX & GSM Basestations, SATCOM, Precision Time Base Reference (1PPS), and Navigation Systems**

Module Specification (Typical):	M9103S	M9103D										
1 PPS Accuracy	±25ns to UTC RMS (1-Sigma) GPS Locked (no motion, stable temperature, still air)	±15ns to UTC RMS (1-Sigma) GPS Locked (no motion, stable temperature, still air)										
Frequency Stability		Better than $\pm 3 \times 10^{-10}$ after 3 hrs. operation with GPS lock										
Holdover Stability	$< \pm 50 \mu\text{s}$ over 24 hr. period @ +25°C	$< \pm 7 \mu\text{s}$ over 24 hr. period at +25°C. (No Motion)										
ADEV (Allan Deviation)	$< 1 \times 10^{-11}/\text{sec}$	0.1 s to 1000 s: $< 1 \times 10^{-11}$ with GPS lock.										
1 PPS Output	LVDS compatible	LVDS Output, RS-232 level output										
10 MHz Output	LVDS and HCMOS compatible	Two LVDS, and three isolated sine wave at +13 dBm, ± 3 dBm										
Distribution Amplifier Port Isolation		2 MHz: > 98 dB. 10 MHz: > 92 dB. 1 GHz: > 92 dB.										
RS-232 Control	RS-232 Levels. SCPI-99 Control Commands 1 PPS output level for Linux SNTP Server Software with D Sub RTS pin.	Full control via SCPI-99 control commands.										
GPS Frequency	L1, C/A 1574 MHz (Galileo supported when available)	L1, C/A 1574MHz										
GPS Antenna	Active or Passive Type	Passive, or Active (5 V)										
GPS Receiver	50 channels, Mobile, WAAS, EGNOS, MSAS, capable	50 Channels, Mobile, WAAS, EGNOS, MSAS supported, Galileo ready.										
GPS Receiver Sensitivity	Acquisition -144 dBm, tracking -160 dBm	Acquisition -144 dBm, Tracking -160 dBm										
TTFF	Cold Start: <45sec. Warm Start: 1 sec. Hot Start: 1 sec.	Cold Start - <45 sec, Warm Start – 1 sec, Hot Start - 1 sec										
TTL Alarm Output	GPS Unlock and Hardware Failure Status	GPS Unlock and Hardware Failure indicators										
Warm Up Time / Stabilization Time	< 12 min. at +25°C for 1 E-09 accuracy.	< 10 min at +25°C to 1×10^{-9} accuracy typical										
Supply Voltage (Vdd)	12.0 VDC ± 5%	+ 12 VDC ± 5% Nominal										
Power Consumption	< 2.5 W at 12 V and +25°C	< 4 W Max. at +25°C										
Operating Temperature	0°C to +60°C	0°C to +75°C (-25°C to +75°C available)										
Storage Temperature	-45°C to +85°C	-45°C to +85°C										
Oscillator Specification:												
Frequency Output	10 MHz (Other frequencies 5-20 MHz available)	10MHz										
Retrace	± 2 E-08 after 1 hr.	± 2 X 10 ⁻⁸ After 1 Hour										
Frequency Stability Over Temperature (Unlock Condition)	± 2.5 E - 8 (Unlocked Condition)	± 2.5 X 10 ⁻¹⁰										
Output Amplitude	5 V HCMOS, LVDS ± 30 mV differential (Refer to user manual for pin out information)	Sine wave: +13 dBm, ± 3 dBm, LVDS at ± 300 mV										
Warm Up Time		< 12 min										
Phase Noise	1 Hz -85 dBc/Hz 10 Hz -115 dBc/Hz 100 Hz -140 dBc/Hz 1 kHz -150 dBc/Hz 10 kHz -158 dBc/Hz	<table border="1"> <tr> <td>1Hz</td><td>-90 dBc/Hz</td></tr> <tr> <td>10Hz</td><td>-135 dBc/Hz</td></tr> <tr> <td>100Hz</td><td>-145 dBc/Hz</td></tr> <tr> <td>1kHz</td><td>-150 dBc/Hz</td></tr> <tr> <td>10kHz</td><td><-155 dBc/Hz</td></tr> </table>	1Hz	-90 dBc/Hz	10Hz	-135 dBc/Hz	100Hz	-145 dBc/Hz	1kHz	-150 dBc/Hz	10kHz	<-155 dBc/Hz
1Hz	-90 dBc/Hz											
10Hz	-135 dBc/Hz											
100Hz	-145 dBc/Hz											
1kHz	-150 dBc/Hz											
10kHz	<-155 dBc/Hz											
Design Lifetime		> 10 years										

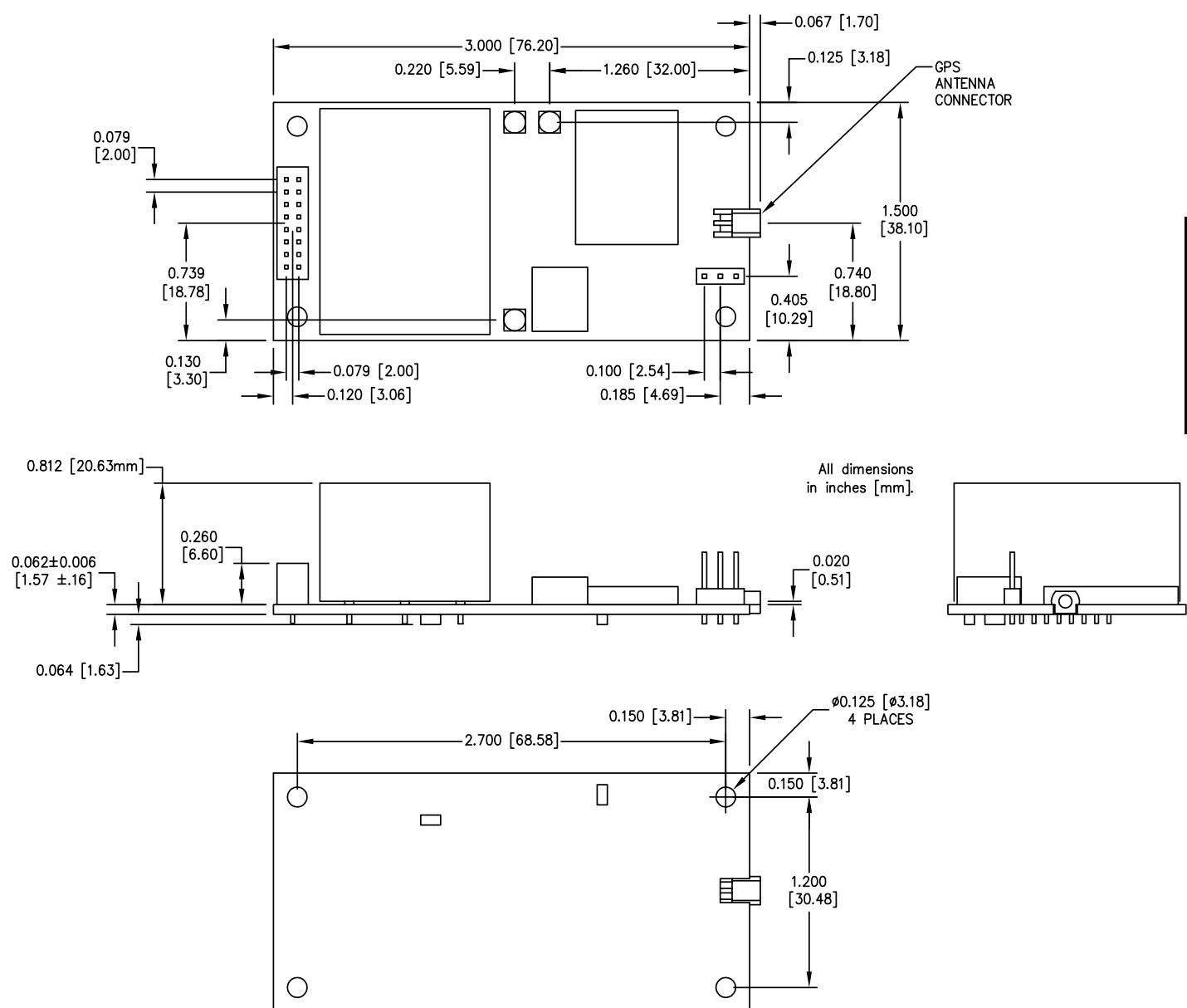
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M9103 Series

1.5 x 3.0 x 0.8 inches, GPSDO (Global Positioning Satellite Disciplined Oscillator) With 3-Port Distribution Amplifier



G
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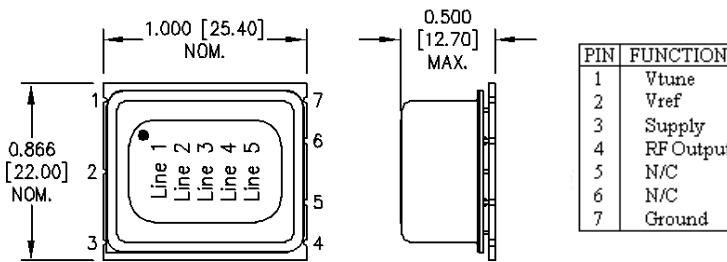
OCXO and DOCXO Selection Guide

Package Size	Supply Voltage	Output Logic	Frequency Range	Family	Page Number
1 x 0.87 inch	5 to 15 Volt	HCMOS/Sinewave	10 - 100 MHz	XO5180	
1 x 0.87 inch	3.3 Volt	Synchronous Ethernet HCMOS	10 - 20 MHz	XO5184-1588	
1 x 1 inch	3.3 Volt	Synchronous Ethernet HCMOS	10 - 20 MHz	XO5084-1588	
1 x 1 inch	5 Volt	HCMOS/Sinewave	3 - 100 MHz	XO5080	
1.4 x 1 inch	12 Volt	Sinewave (DOCXO)	10 MHz	XO5153	
1.4 x 1 inch	3.3 to 12 Volt	HCMOS/Sinewave	10 - 100 MHz	XO5120	
1.4 x 1 inch	12 Volt	Sinewave	50 - 160 MHz	XO5125	
14 pin DIP	5.0 Volt	HCMOS/TTL	10 - 20 MHz	XO5160	
14 pin DIP	12.0 Volt	HCMOS/TTL	10 - 20 MHz	XO5161	
14 pin DIP	5.0 Volt	Sinewave	10 - 20 MHz	XO5162	
14 pin DIP	12.0 Volt	Sinewave	10 - 20 MHz	XO5163	
14 pin DIP	3.3 Volt	HCMOS	10 - 20 MHz	XO5164	

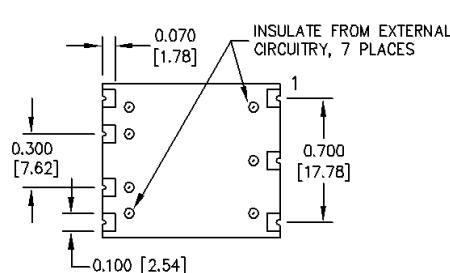
XO5180 Series

1x0.87 inch, 5.0 Volt, HCMOS or Sinewave, OCXO

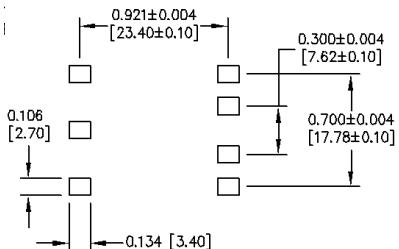
- Surface mount package offering both AT and SC-cut crystals
- Ideal for microwave radios (short haul), base stations and test equipment applications where size and package style (SMT) are critical



Ordering Information	
XO518x	00.0000 MHz
Product Series	_____
5181: AT/Sine	
5182: AT/HCMOS	
5183: SC/Sine	
5184: SC/HCMOS	
Frequency (Customer Specified)	_____



Pin Numbers shown for reference only.
Dimensions are in inches (mm).



Optional Temperature Ranges and Frequency Stabilities (F/T)		
OTR °C	SC-Cut	AT-Cut
0 to +50	$\pm 5 \times 10^{-9}$	$\pm 2 \times 10^{-8}$
0 to +70	$\pm 10 \times 10^{-9}$	$\pm 2 \times 10^{-8}$
-10 to +70	$\pm 10 \times 10^{-9}$	$\pm 2 \times 10^{-8}$
-30 to +70	$\pm 10 \times 10^{-9}$	$\pm 3 \times 10^{-8}$
-40 to +70	$\pm 10 \times 10^{-9}$	$\pm 3 \times 10^{-8}$
-40 to +85	$\pm 20 \times 10^{-9}$	$\pm 4 \times 10^{-8}$

Electrical Specifications						
PARAMETER	Symbol	Minimum	Typical	Maximum	Units	Condition
Frequency Range	F_{ON}	10		100	MHz	
Operating Temperature	T_A		-40 to +85		°C	Consult Factory
Stability Over Temperature	$\Delta F/F$	± 20	± 30		ppb	AT-Cut
	$\Delta F/F$	± 5	± 30		ppb	SC-Cut
Short Term Stability			0.1		ppb	AT-Cut
			0.01		ppb	SC-Cut
Daily Aging			± 1.0		ppb	AT-Cut
Yearly Aging			± 0.5		ppm	AT-Cut
Daily Aging			± 0.1		ppb	SC-Cut
Yearly Aging			± 0.3		ppm	SC-Cut
Frequency vs. Supply			± 1		ppb	
Frequency vs. Load			± 1		ppb	
Supply Voltage	V_S	3.3 to 12			Volts	Consult Factory
Power Consumption @ Warm-Up Steady State @ 25°C				3.5 1.25	Watts Watts	
Warm-Up Time @ 25°C		To within $\pm 1 \times 10^{-7}$ in 3 minutes			Minutes	
HCMOS Output Signal		$V_S = +3.3$ or $+5V$				
Rise/Fall Time		0.2	5nsec	7nsec	Volts	
Logic "0" Level		40	10	$V_S - 0.2$ 60	Volts % pF	
Logic "1" Level						
Symmetry						
Output Load						
Sinewave Output Signal			+3 50		dBm Ω	
Level						
Output Load						
Frequency Adjustment (Pin 1)						
Slope		0	Positive			
External Voltage				10	Volts	Consult Factory
Range					ppm	AT-Cut
Range					ppm	SC-Cut
Input Impedance (Pin 1)		20	± 4 ± 2	10	$K\Omega$	
Phase Noise						
Typical @ 10MHz						
1 Hz			-80	-90	dBc/Hz	
10 Hz			-115	-120	dBc/Hz	
100 Hz			-140	-140	dBc/Hz	
1 kHz			-145	-150	dBc/Hz	
10 kHz			-150	-155	dBc/Hz	
Mechanical Shock		Per MIL-STD-202, Method 213, Condition C				
Vibration		Per MIL-STD-202, Method 201 & 204				
Storage Temperature		-55°C to +125°C				
Hermeticity		Per MIL-STD-202, Method 112				
Solderability		Per EIAJ-STD-002				

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XO5184-1588-R Series

Synchronous Ethernet HCMOS SMT or Through Hole OCXO



- Ideal for IEEE-1588 Synchronized Ethernet Applications
- Specifically designed for 10 MHz, 12.8 MHz and 20 MHz Frequencies

Ordering Information

XO5184-1588-R

S

Product Series

Package Type

S: Surface Mount
(BLANK): Through Hole

Electrical Specifications

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Frequency Range	F	10.000		20.000	MHz	
Initial Accuracy	F_I	-0.5		+0.5	ppm	@ 25°C at time of shipment
Overall		-4.6		+4.6	ppm	Over 20 years
vs Temperature	$\Delta F_T/F$	-10		+10	ppb	Over operating temperature range
vs Supply Voltage	$\Delta F_{VDD}/F$	-2		+2	ppb	5% change in voltage
Short Term Stability			1×10^{-11}		per sec.	Allan Deviation $Tau = 1$ sec.
Holdover/Day		-1		+1	ppb	Constant voltage and load; $<\pm 3\%$ change in 24 hours after 30 days of continuous operation
Output Type			HCMOS			
Output Load			15		pF	
Symmetry (duty cycle)	T_{DC}	40	50	60	%	@ 50% of waveform
Rise/Fall Time	T_R/T_F			10	ns	From 10% to 90% V_{OUT}
Logic "1" Level	V_{OH}	90% V_{DD}			V	HCMOS Load
Logic "0" Level	V_{OL}			10% V_{DD}	V	HCMOS Load
Operating Temperature	T_A	-10		+70	°C	Other temperature ranges are available, please contact the factory
Storage Temperature	T_S	-45		+85	°C	
Operating Voltage	V_{DD}	3.135	3.3	3.465	V	
Power Consumption				1.25	Watts	Steady state @ 25°C in still air
				3.5	Watts	@ warm-up
Warm-up Time (Restabilization)				3	Minutes	Time to be within ± 0.1 ppm of the frequency after 1 hour of operation @ 25°C
Phase Noise (typical)			-130		dBc/Hz	100 Hz
			-145		dBc/Hz	1 kHz
			-150		dBc/Hz	10 kHz
			-150		dBc/Hz	100 kHz
Environmental	Mechanical Shock	Per MIL-STD-202, Method 213, (2000 g's, 0.3 ms duration, 1/2 sinewave)				
	Vibration	Per MIL-STD-202, Method 201 & 204 (10 g's from 20-2000 Hz)				
	Hermeticity	Per MIL-STD-202, Method 112, Test Condition D				
	Solderability	Per EIAJ-STD-002				
	Soldering Conditions	See solder profile				
	RoHS	Full RoHS 6 Compliance				

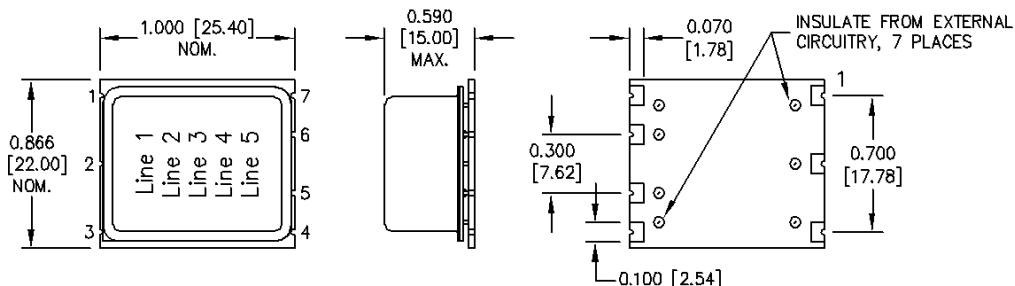
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XO5184-1588-R Series

Synchronous Ethernet HCMOS SMT or Through Hole OCXO

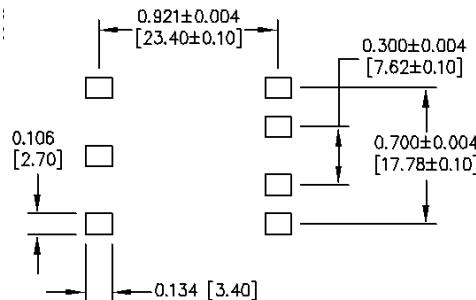
SMT Package

Please contact the factory for other surface mount configurations.



All dimensions are in inches [mm].

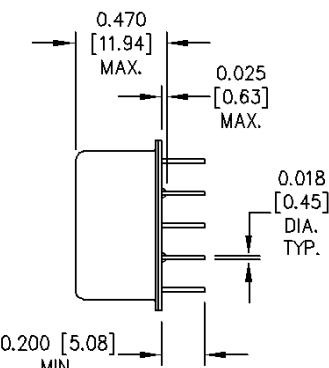
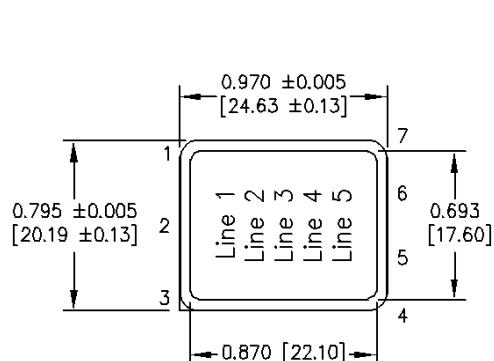
Part Marking	
Line 1	MtronPTI
Line 2	XO5184-1588
Line 3	Frequency
Line 4	Serial Number
Line 5	YYWW



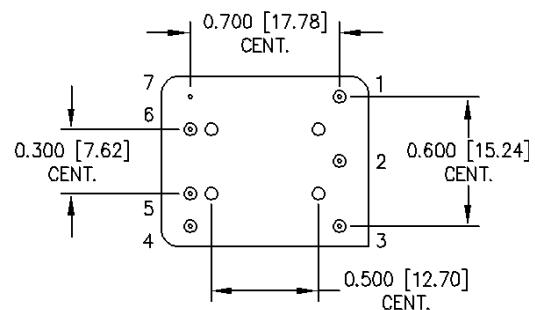
Pin	Function
1	N/C
2	N/C
3	Supply Voltage
4	RF Output
5	N/C
6	N/C
7	Case Ground

Suggested Solder Pad Layout

Through Hole Package



All dimensions are in inches [mm].



Part Marking	
Line 1	MtronPTI
Line 2	XO5184-1588
Line 3	Frequency
Line 4	Serial Number
Line 5	YYWW

Pin	Function
1	Vtune
2	N/C
3	N/C
7	Vref
8	Ground
9	Ground
10	RF Output
16	Supply

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XO5084-1588-R Series

Synchronous Ethernet HCMOS SMT or Through Hole OCXO



- Ideal for IEEE-1588 Synchronized Ethernet Applications
- Specifically designed for 10 MHz, 12.8 MHz and 20 MHz Frequencies

Ordering Information

XO5084-1588-R S

Product Series

Package Type
S: Surface Mount
(BLANK): Through Hole

	Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
	Frequency Range	F	10.000		20.000	MHz	
	Initial Accuracy	F_I	-0.5		+0.5	ppm	@ 25 °C at time of shipment
	Overall		-4.6		+4.6	ppm	Over 20 years
	vs Temperature	$\Delta F_T/F$	-10		+10	ppb	Over operating temperature range
	vs Supply Voltage	$\Delta F_{VDD}/F$	-2		+2	ppb	5% change in voltage
	Short Term Stability			1×10^{-11}		per sec.	Allan Deviation $Tau = 1$ sec.
	Holdover/Day		-1		+1	ppb	Constant voltage and load; $<\pm 3\%$ °C change in 24 hours after 30 days of continuous operation
Electrical Specifications	Output Type			HCMOS			
	Output Load			15		pF	
	Symmetry (duty cycle)	T_{DC}	40	50	60	%	@ 50% of waveform
	Rise/Fall Time	T_R/T_F			10	ns	From 10% to 90% V_{OUT}
	Logic "1" Level	V_{OH}	90% V_{DD}			V	HCMOS Load
	Logic "0" Level	V_{OL}			10% V_{DD}	V	HCMOS Load
	Operating Temperature	T_A	-10		+70	°C	Other temperature ranges are available, please contact the factory
	Storage Temperature	T_S	-45		+85	°C	
	Operating Voltage	V_{DD}	3.135	3.3	3.465	V	
	Power Consumption				1.25	Watts	Steady state @ 25 °C in still air
					3.5	Watts	@ warm-up
	Warm-up Time (Restabilization)				3	Minutes	Time to be within ± 0.1 ppm of the frequency after 1 hour of operation @ 25 °C
	Phase Noise (typical)			-130		dBc/Hz	100 Hz
				-145		dBc/Hz	1 kHz
				-150		dBc/Hz	10 kHz
				-150		dBc/Hz	100 kHz
Environmental	Mechanical Shock		Per MIL-STD-202, Method 213, (2000 g's, 0.3 ms duration, 1/2 sinewave)				
	Vibration		Per MIL-STD-202, Method 201 & 204 (10 g's from 20-2000 Hz)				
	Hermeticity		Per MIL-STD-202, Method 112, Test Condition D				
	Solderability		Per EIAJ-STD-002				
	Soldering Conditions		See solder profile				
	RoHS		Full RoHS 6 Compliance				

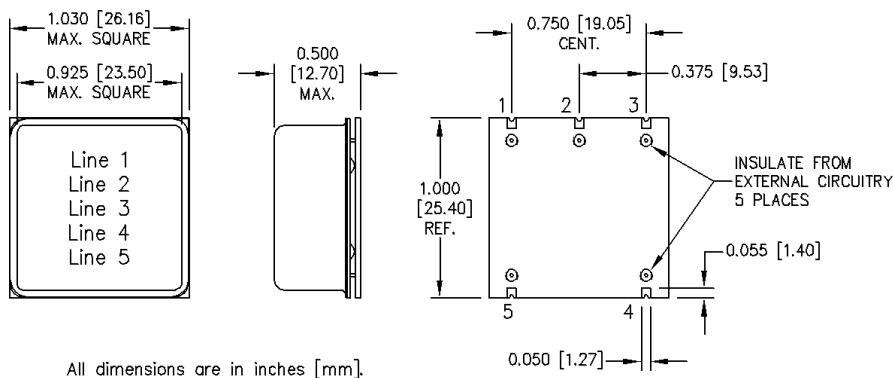
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XO5084-1588-R Series

Synchronous Ethernet HCMOS SMT or Through Hole OCXO

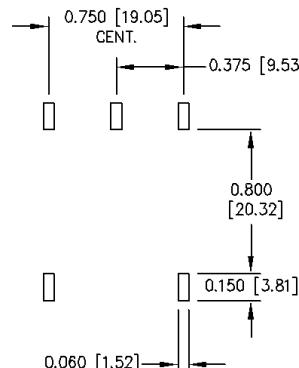
SMT Package

Please contact the factory for other surface mount configurations.



All dimensions are in inches [mm]

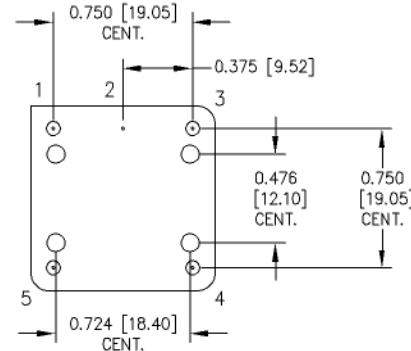
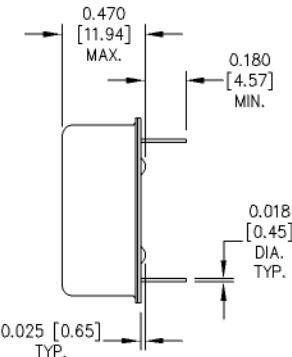
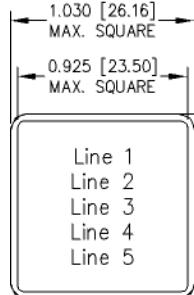
Part Marking	
Line 1	MtronPTI
Line 2	XO5084-1588
Line 3	Customer P/N (option)
Line 4	Frequency
Line 5	YYWW



Pin	Function
1	RF Output
4	Case Ground
7	V Tune
13	V Ref
17	Oven Ready
19	Supply Voltage
2,6,15	N/C

Suggested Solder Pad Layout

Through Hole Package



All dimensions are in inches [mm]

Part Marking	
Line 1	MtronPTI
Line 2	XO5084-1588
Line 3	Customer P/N (option)
Line 4	Frequency
Line 5	YYWW

Pin	Function
1	RF Output
2	Case Ground
3	N/C
4	N/C
5	Supply Voltage

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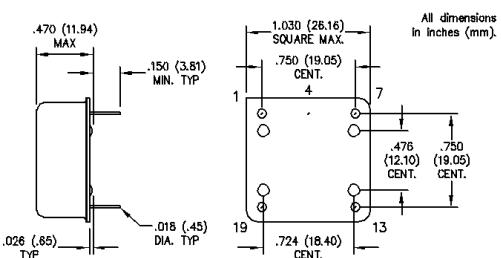
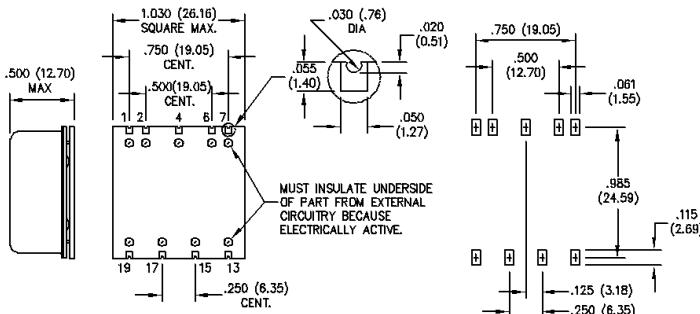
XO5080 Series

1 x 1 inch, 5.0 Volt, HCMOS or Sinewave, OCXO

MtronPTI®



- Surface mount package offering both AT and SC-cut crystals
- Ideal for microwave radios (short haul), base stations and test equipment applications where size and package style (SMT) are critical



Dimensions are in inches (mm)

PIN CONNECTIONS	
1. RF OUTPUT	
2. N/C	
4. CASE GROUND & SUPPLY RETURN	
6. N/C	
7. FREQUENCY ADJUST OR Vref	
13. Vref (OPTIONAL)	
15. N/C	
17. OVEN READY (OPTIONAL)	
19. SUPPLY (+)	

Pin numbers shown for ref. only.
Numbers are not marked on unit.

Optional Temperature Ranges and Frequency Stabilities (F/T)		
OTR °C	SC-Cut	AT-Cut
0 to +50	$\pm 5 \times 10^{-9}$	$\pm 2 \times 10^{-8}$
0 to +70	$\pm 10 \times 10^{-9}$	$\pm 2 \times 10^{-8}$
-10 to +70	$\pm 10 \times 10^{-9}$	$\pm 2 \times 10^{-8}$
-30 to +70	$\pm 10 \times 10^{-9}$	$\pm 3 \times 10^{-8}$
-40 to +70	$\pm 10 \times 10^{-9}$	$\pm 3 \times 10^{-8}$
-40 to +85	$\pm 20 \times 10^{-9}$	$\pm 4 \times 10^{-8}$

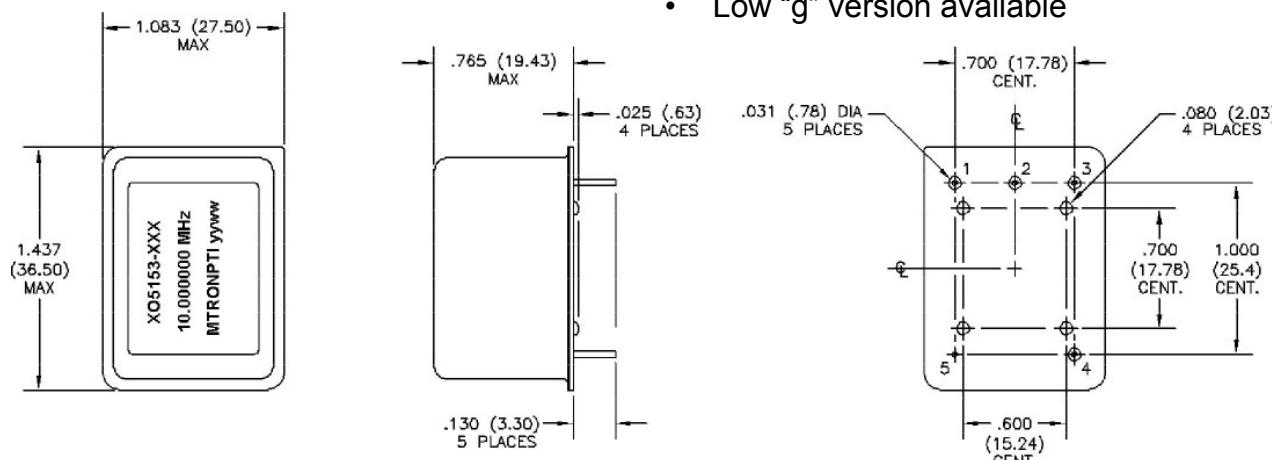
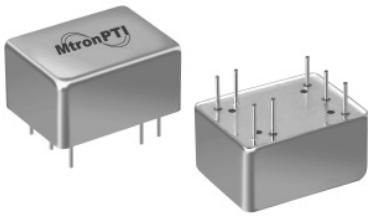
Ordering Information						
Product Series		Assigned Customer Specific				
5081: AT/Sine						XO508x
5082: AT/HCMOS						XXX
5083: SC/Sine						
5084: SC/HCMOS						
Assigned Customer Specific						
Electrical Specifications						
PARAMETER	Symbol	Minimum	Typical	Maximum	Units	Condition
Frequency Range	F_{ON}	10		100	MHz	
Operating Temperature	T_A	-40 to +85			°C	Consult Factory
Stability Over Temperature	$\Delta F/F$	± 20	± 30		ppb	AT-Cut
	$\Delta F/F$	± 5	± 30		ppb	SC-Cut
Short Term Stability			0.1		ppb	AT-Cut
			0.01		ppb	SC-Cut
Daily Aging			± 1.0		ppb	AT-Cut
Yearly Aging			± 0.5		ppm	AT-Cut
Daily Aging			± 0.1		ppb	SC-Cut
Yearly Aging			± 0.3		ppm	SC-Cut
Frequency vs. Supply			± 1		ppb	
Frequency vs. Load			± 1		ppb	
Supply Voltage	V_S	3.3 to 12			Volts	Consult Factory
Power Consumption				3.5	Watts	
@ Warm-Up				1.25	Watts	
Steady State @ 25°C						
Warm-Up Time @ 25°C		To within $\pm 1 \times 10^{-7}$ in 3 minutes			Minutes	
HCMOS Output Signal		$V_S = +3.3V$ or $+5V$				
Rise/Fall Time		0.2	5nsec	7nsec	Volts	
Logic "0" Level		40		$V_S - 0.2$	Volts	
Logic "1" Level			10	60	%	
Symmetry					pF	
Output Load						
Sinewave Output Signal						
Level			$+3$		dBm	
Output Load			50		Ω	
Frequency Adjustment (Pin 7)						
Slope						
External Voltage	V_C	0	Positive			
Range						
Range			± 4		Volts	Consult Factory
Input Impedance (Pin 7)			± 2	10	ppm	AT-Cut
Phase Noise					$K\Omega$	SC-Cut
Typical @ 10MHz						
1 Hz						
10 Hz						
100 Hz						
1 kHz						
10 kHz						
Mechanical Shock		Per MIL-STD-202, Method 213, Condition C				
Vibration		Per MIL-STD-202, Method 201 & 204				
Storage Temperature		-55°C to 125°C				
Hermeticity		Per MIL-STD-202, Method 112				
Solderability		Per EIAJ-STD-002				

HCMOS Load – see load circuit diagram #2. Sinewave Load – see load circuit diagram #3.

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XO5153 Series

1.4 x 1 inch, Double OCXO (DOCXO)



O
C
X
O

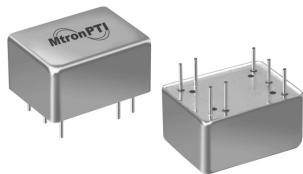
Pin	Function
1	Tuning Voltage
2	N/C
3	Supply Voltage
4	RF Output
5	Ground/Case

Parameters	Min.	Typ.	Max.	Unit	Conditions
Nominal Frequency	F_0	10.000000		MHz	
Frequency Vs. Temperature			0.5	ppb	pk-pk
Frequency Vs. Supply	-0.1		+0.1	ppb	± 100 mV supply voltage change.
Frequency Vs. Aging	-0.6		+0.6	ppm	For 10 years.
Allan Deviation		7×10^{-12}			For 1 sec.
Operating Temperature	OTR	-40	+75	°C	
Storage Temperature	T_{STG}	-55	+105	°C	
Warm-Up Time		To be within 2×10^{-8} at 5min relative to 1 hr.			@ +25°C. Supply = 12 VDC.
Frequency Adjustment	± 0.8		± 2.0	ppm	Sufficient to cover all tolerances for 10 years. Positive tuning slope.
Frequency Adjust Voltage	0		+5.0	VDC	Pin 1
Supply Voltage	V_s	+11.4	+12.0	+12.6	VDC
Turn-On Supply Power			6.0	W	All temperatures
Steady State Power		1.7	1.9	W	In still air at +25°C
Output Type	Sine wave				
Output Level	+6.0	+9.0	+12.0	dBm	
Output Load Impedance		50		Ω	$\pm 5\%$
Spurious Content			-70	dBc	
Harmonic Content			-20	dBc	
SSB Phase Noise			-95 -132 -155 -158 -160 -160	dBc/Hz	@ 1 Hz offset @ 10 Hz offset @ 100 Hz offset @ 1 kHz offset @ 10 kHz offset @ 100 kHz offset
Mechanical Shock	Per MIL-STD-202G, Method 213, Condition A, 50 g peak, half-sine. Survival only with power applied.				
Mechanical Vibration	Per MIL-STD-202G, Method 214, Condition IA (0.02 g ² /Hz, 100 Hz to 1000 Hz) Survival only with power applied				
Package Type	1.083" X 1.437" X 0.765" 5-pin through hole				

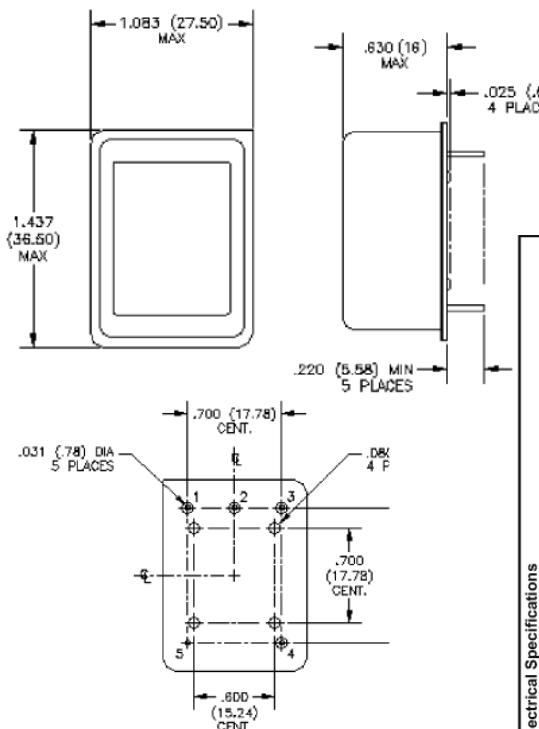
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XO5120 Series

1.4x1 inch, HCMOS or Sinewave, OCXO



- Most precise single, OCXO in the industry
- Stability to ± 2 ppb (commercial temperature) and ± 3 ppb (industrial temperature)
- Excellent phase noise performance (-155 dBc at 10kHz offset)
- Custom capabilities for specific application optimization
- RoHS 5/6 now - RoHS 6/6 in development



DIMENSIONS ARE SHOWN IN INCHES (MM)
PIN NUMBERS SHOWN FOR REFERENCE ONLY

Pin	Function
1	Vtune
2	Vref
3	Supply
4	RF Out
5	Ground
6*	OvenReady (Option) or N/C

* Pin #6 may be enabled as "Oven Ready", No Connection, or removed entirely.

Ordering Information

XO512x - XXX-V

Product Series

5121: AT/Sine
5122: AT/HCMOS/TTL
5123: SC/Sine
5124: SC/HCMOS/TTL

Assigned Customer Specific

RoHS 5/6

V: RoHS 5/6
R: RoHS 6/6 (contact factory for availability)

Optional Temperature Ranges and Frequency Stabilities (F/T)

OTR °C	SC-Cut	AT-Cut
0 to +50	$\pm 2 \times 10^{-9}$	$\pm 2 \times 10^{-8}$
0 to +70	$\pm 2 \times 10^{-9}$	$\pm 2 \times 10^{-8}$
-10 to +70	$\pm 3 \times 10^{-9}$	$\pm 2 \times 10^{-8}$
-30 to +70	$\pm 3 \times 10^{-9}$	$\pm 3 \times 10^{-8}$
-40 to +70	$\pm 3 \times 10^{-9}$	$\pm 3 \times 10^{-8}$
-40 to +85	$\pm 3 \times 10^{-9}$	$\pm 4 \times 10^{-8}$

Electrical Specifications

PARAMETER	Symbol	Minimum	Typical	Maximum	Units	Condition
Frequency Range	F_{ON}	10		100	MHz	
Operating Temperature	T_A		-40 to +85		°C	Consult Factory
Stability Over Temperature	$\Delta F/F$	± 20	± 30		ppb	AT-Cut
		± 5	± 10		ppb	SC-Cut
Short Term Stability			0.1		ppb	AT-Cut
			0.01		ppb	SC-Cut
Daily Aging			± 1.0		ppb	AT-Cut
Yearly Aging			± 0.5		ppm	AT-Cut
Daily Aging			± 0.1		ppb	SC-Cut
Yearly Aging			± 0.3		ppm	SC-Cut
Frequency vs. Supply			± 1		ppb	
Frequency vs. Load			± 1		ppb	
Supply Voltage	V_S		3.3 to 12		Volts	Consult Factory
Power Consumption				3.5	Watts	
@ Warm-Up				1.25	Watts	
Steady Sate @ 25°C						
Warm-Up Time @ 25°C			To within $\pm 1 \times 10^{-9}$ in 3 minutes		Minutes	
HCMOS Output Signal			$V_S = +3.3V$ or $+5V$			
Rise/Fall Time		0.2	3nsec	7nsec	Volts	
Logic "0" Level		40	10	$V_S - 0.2$	Volts	
Logic "1" Level				60	%	
Symmetry					μF	
Output Load						
Sinewave Output Signal						
Level			$+3$		dBm	
Output Load			50		Ω	
Frequency Adjustment (Pin 7)						
Slope						
External Voltage	V_C	0	Positive			
Range			± 4			
Range		20	± 4	10	Volts	Consult Factory
Input Impedance (Pin 7)					ppm	AT-Cut
Phase Noise				SC-Cut	ppm	SC-Cut
Typical @ 10MHz						
1 Hz		-80		-90	dBc/Hz	
10 Hz		-115		-120	dBc/Hz	
100 Hz		-140		-140	dBc/Hz	
1 kHz		-145		-150	dBc/Hz	
10 kHz		-150		-155	dBc/Hz	
Environmental						
Mechanical Shock			Per MIL-STD-202, Method 213, Condition C			
Vibration			Per MIL-STD-202, Method 201 & 204			
Storage Temperature			-55°C to 125°C			
Hermeticity			Per MIL-STD-202, Method 112			
Solderability			Per EIAJ-STD-002			
Max. Wave Soldering Cond.			+260°C for 10 seconds			

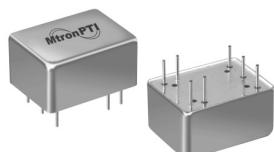
HCMOS Load – see load circuit diagram #2. Sinewave Load - see load circuit diagram #8

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XO5125 Series

1.4 x 1 inch, 12 Volt, Sinewave, OCXO

- Ideal for Precision Instrumentation, ATE Systems, Radar, Synthesizers and other applications dependent upon low noise reference oscillators
- Ultra Low Phase Noise (-168 dBc Floor)



Ordering Information

XO5125 2 XXX -R

Product Series

Operating Temperature

8: 0°C to +50°C

1: 0°C to +70°C

6: -20°C to +70°C

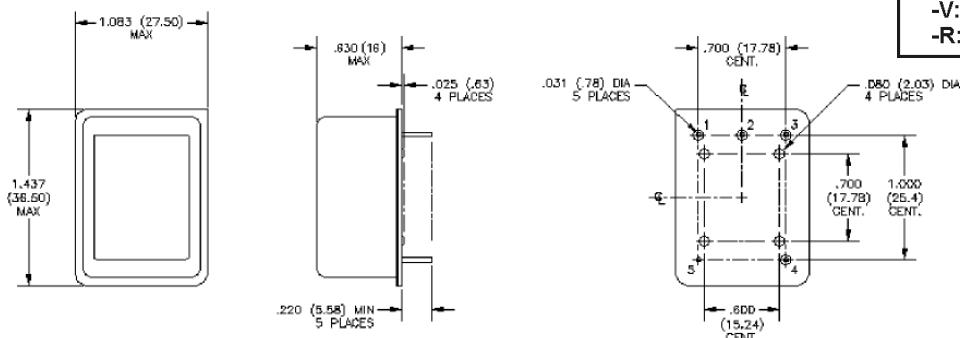
2: -40°C to +85°C

Assigned Customer Specific

Blank: Non-RoHS

-V: RoHS 5/6

-R: RoHS 6/6



DIMENSIONS ARE SHOWN IN INCHES (MM)
PIN NUMBERS SHOWN FOR REFERENCE ONLY

Pin	Function
1	Vtune
2	Vref
3	Supply
4	RF Out
5	Ground

Electrical Specifications	PARAMETER	Symbol	Minimum	Typical	Maximum	Units	Condition
			F _{ON}	50	160	MHz	
	Operating Temperature	T _A		-40 to +85		°C	Consult Factory
	Stability Over Temperature	ΔF/F	±10	±20		ppb	Consult Factory
	Short Term Stability			0.01		ppb	
	Yearly Aging			±2		ppm	Consult Factory
	Frequency vs. Supply			±2		ppb	
	Supply Voltage	V _S		+12		Volts	Consult Factory
	Power Consumption						
	@ Warm-Up						
	Steady State @ 25°C			1.9	3.6	Watts	Watts
	Warm-Up Time @ 25°C			To within ±1 x 10 ⁻⁷ in 3 minutes		Minutes	
	Sinewave Output Signal						
	Level			+7			
	Output Load			50		dBm	Consult Factory
	Ω						
	Frequency Adjustment (Pin 1)						
	Slope						
	Modulation Bandwidth						
	External Voltage						
	Range	V _C	0	1	10	kHz	Consult Factory
	Input Impedance (Pin 7)		20	±3		Volts	Consult Factory
	ppm					ppm	Consult Factory
	KΩ					KΩ	
	Phase Noise						
	Typical @ 100MHz						
	1 Hz			-70		dBc/Hz	
	10 Hz			-100		dBc/Hz	
	100 Hz			-130		dBc/Hz	
	1 kHz			-155		dBc/Hz	
	10 kHz			-168		dBc/Hz	
	Mechanical Shock						
	Vibration						
	Storage Temperature						
	Hermeticity						
	Solderability						
	Max. Wave Soldering Cond.						

Sinewave Load - see load circuit diagram #8

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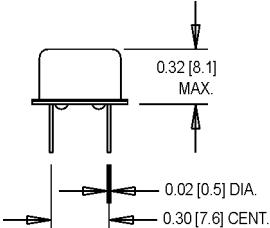
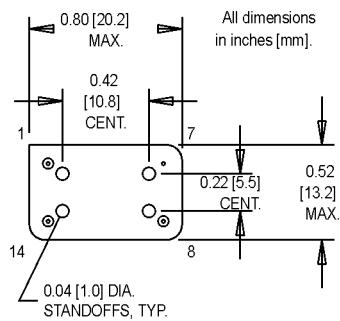
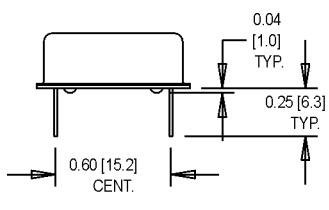
XO5160 - XO5164 Series

14 pin DIP, 3.3, 5.0 or 12.0 Volt, HCMOS/TTL/Sinewave, OCXO



- Standard DIP/DIL package offering tight stabilities, fast warm-up, and low current
- Ideal for PCS base stations, cellular base stations, phase locking, and SAR/SAT applications
- SMT Surfboard Option

DIP Package "D"



Frequency of Operation

(Customer Specified)

M7003Sxxx, M7006Sxxx, M7007Sxxx, M7008Sxxx & M7009Sxxx - Contact factory for datasheets.

Ordering Information

Product Series XO51xx

XO5160 = 5V HCMOS/TTL

XO5161 = 12V HCMOS/TTL

XO5162 = 5V Sinewave

XO5163 = 12V Sinewave

XO5164 = 3.3V HCMOS

Operating Temperature

A = 0°C to +60°C

B = -20°C to +70°C

C = -40°C to +85°C

Frequency Stability

H: ±0.05 ppm G: ±0.075 ppm

A: ±0.1 ppm B: ±0.15 ppm

C: ±0.2 ppm D: ±0.25 ppm

E: ±0.3 ppm F: ±0.5 ppm

Frequency Adjustment

R1 = Internal voltage with external potentiometer (Fig. 1)

V5 = External voltage with external potentiometer (Fig. 2)

Package Configuration

D: 14 pin DIP

S: Surfboard

RoHS Compliance

Blank: non RoHS compliant part

-R: RoHS compliant part

Frequency of Operation

(Customer Specified)

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XO5160 - XO5164 Series

14 pin DIP, 3.3, 5.0 or 12.0 Volt, HCMOS/TTL/Sinewave, OCXO



Parameter		Symbol	Min.	Typ.	Max.	Units	Conditions/Notes
Frequency Range	XO5160	F_O	10.0000		40.0000	MHz	
Operating Temperature	XO5160	T_A	-40		+85	°C	See Ordering Information & Table 1
Frequency Stability	XO5160		± 0.05		± 0.5	ppm	See Ordering Information & Table 1
Short-Term Stability	XO5160				5×10^{-10}		Tau = 0.1 to 30 secs.
Frequency Vs. Aging	XO5160				0.7	ppm	First year
	XO5160				± 4.0	ppm	For 10 years
Frequency Vs. Supply	XO5160				± 0.1	ppm	For ± 0.2 volt supply variation
Frequency Vs. Load	XO5160				± 0.01	ppm	
Supply Voltage	XO5160	V_{dd}	4.75	5.0	5.25	V	
	XO5161	V_{dd}	11.5	12.0	12.5	V	
	XO5162	V_{dd}	4.75	5.0	5.25	V	
	XO5163	V_{dd}	11.5	12.0	12.5	V	
	XO5164	V_{dd}	3.15	3.3	3.45	V	
Supply Current	XO5160	I_{dd}			70	mA	At +30°C
	XO5161	I_{dd}			30	mA	At +30°C
	XO5162	I_{dd}			70	mA	At +30°C
	XO5163	I_{dd}			30	mA	At +30°C
	XO5164	I_{dd}			110	mA	At +30°C
Turn-On Current	XO5160	I_{to}			250	mA	After 10 secs.
Warm-Up Time	XO5160				2×10^{-7}		2 min after power up following 4 hour off time – reference to frequency after 1 hour of operation
Tuning Voltage	XO5160	V_T	0.5		5.0	V	
	XO5161	V_T	0		5.0	V	
	XO5162	V_T	0.5		5.0	V	
	XO5163	V_T	0		5.0	V	
	XO5164	V_T	0		3.3	V	
Frequency Adjustment	XO5160		± 4.0			ppm	Over tuning voltage range
Output Level	XO5160		1		2	Vpk-pk	Sinewave 50 Ohm load
Symmetry	XO5160	Sym	45/55		55/45	%	Ref. To $\frac{1}{2} V_{dd}$ HCMOS output logic
Output Load	XO5160	R_L			15	pF	XO5160, XO5161, XO5164 only
	XO5161	R_L			10	LSTTL	XO5160, XO5161, XO5164 only
	XO5162	R_L	50			Ohms	XO5162, XO5163 only
Rise/Fall Time (10% to 90%)	XO5160	Tr/Tf			7	nS	1-40 MHz (Frequency dependent) HCMOS output logic
Logic Level "0"	XO5160	V_{OL}			10% V_{dd}	V	HCMOS output logic
Logic Level "1"	XO5160	V_{OH}	90% V_{dd}			V	HCMOS output logic
Phase Noise (Typical) 10 MHz	XO5160						
1 Hz	XO5160				-70	dBc/Hz	Offset from carrier
10 Hz	XO5160				-100	dBc/Hz	Offset from carrier
100 Hz	XO5160				-130	dBc/Hz	Offset from carrier
1 kHz	XO5160				-140	dBc/Hz	Offset from carrier
10 kHz	XO5160				-145	dBc/Hz	Offset from carrier
100 kHz	XO5160				-150	dBc/Hz	Offset from carrier
Environmental	Vibration	2000 Hz, 10 g					
	Storage Temperature	-55°C to +125°C					
	Hermeticity	Per MIL-STD-202, Method 112					
	Solderability	Per EIAJ-STD-002					
	Max Soldering Conditions	+245°C for 10 secs. Max. (DIP version only)					
	Max Soldering Conditions	+220°C for 10 secs. Max. (SMT version only)					

XO5160-XO5162: TTL Load – see load circuit diagram #1. HCMOS Load – see load circuit diagram #2.

XO5163: Sinewave Load – see load circuit diagram #8.

XO5164: HCMOS Load - see load circuit diagram #2.

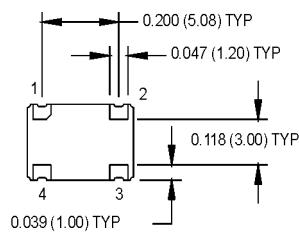
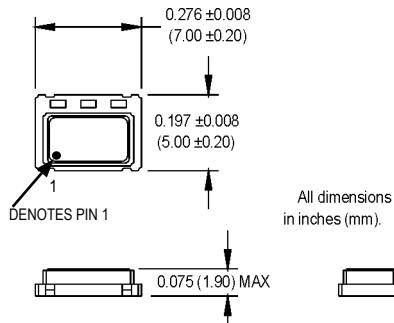
TCXO Selection Guide

Package Size	Supply Voltage	Output Logic	Frequency Range	Family	Type	Page Number
5 x 7 mm	3.0 Volt	Sinewave	12.6 - 26 MHz	M6029	TCXO	
5 x 7 mm	3.0 Volt	Sinewave	12.6 - 26 MHz	M6030	TCVCXO	
5 x 7 mm	3.0, 3.3 & 5.0 Volt	HCMOS/Clipped Sinewave	8 - 52 MHz	M610x Stratum 3	TCXO/ TCVCXO	
5 x 7 mm	3.0, 3.3 & 5.0 Volt	HCMOS/Clipped Sinewave	8 - 52 MHz	M611x	TCXO/ TCVCXO	
5 x 7 mm	3.0, 3.3 & 5.0 Volt	HCMOS/Clipped Sinewave	8 - 52 MHz	M616x	TCXO/ TCVCXO	
5 x 7 mm	1.8, 2.5 & 3.3 Volt	LVPECL/LVDS /CML/HCMOS	50 - 1400 MHz	M630x	TCXO/ TCVCXO	
9 x 14 mm	3.0, 3.3 & 5.0 Volt	HCMOS/Clipped Sinewave	8 - 130 MHz	M613x	TCXO/ TCVCXO	
0.84 x 0.46 inch	3.0, 3.3 & 5.0 Volt	HCMOS/Clipped Sinewave	8 - 52 MHz	M612x	TCXO	
1.1 x 0.7 inch	3.3 & 5.0 Volt	HCMOS/ Sinewave	10 - 125 MHz	XO3080	TCXO	

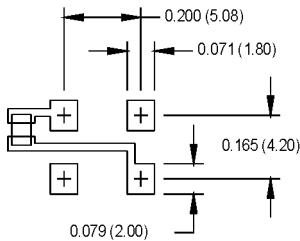
M6029 and M6030 Series

5x7 mm, 3.0 Volt, Clipped Sinewave, TCXO/TCVCXO

- Miniature size
- Ideal for handheld and portable devices



SUGGESTED SOLDER PAD LAYOUT



PIN	FUNCTION
1	N/C or Control Voltage
2	Ground/Case
3	Output
4	+Vdd

Electrical Specifications						
PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition/Notes
Frequency Range	F	12.6		26	MHz	
Operating Temperature	T_A	(See Ordering Information)				
Storage Temperature	T_S	-30		+75	°C	
Frequency Stability	ΔF/F	(See Ordering Information)				
Aging						
1st Year		-1		+1	ppm	@25°C
Thereafter (per year)		-1		+1	ppm	@25°C
Control Voltage	V_C	0.5	1.5	2.5	V	M6030
Tuning Range		±5		±15	ppm/V	M6030
Input Voltage	V_{dd}	2.85	3.0	3.15	V	
Input Current	I_{dd}			2.5	mA	
Output Type						Clipped Sinewave
Load		10 ohms 10pF				
Output Level		0.8			V	pk-pk
Start up Time			5		ms	
Phase Noise (Typical)		100 Hz -80	100 Hz -110	1 kHz -130	10 kHz -145	Offset from carrier dBc/Hz
Environmental						
Shock	MIL-STD-202, Method 213, Condition C					100 g
Vibration	MIL-STD-202, Method 201 & 204					10 g from 10 to 2000 Hz
Solderability	EIAJ-STD-002					
Max Soldering Conditions	See solder profile, Figure 1					

Clipped Sinewave Load – see load circuit diagram #7.

M610x Series Stratum 3

5 x 7 mm, 3.0, 3.3 & 5.0 Volt, HCMOS or Clipped Sinewave,
Precision TCXO/TCVCXO



N (10 Pad)
Package Option

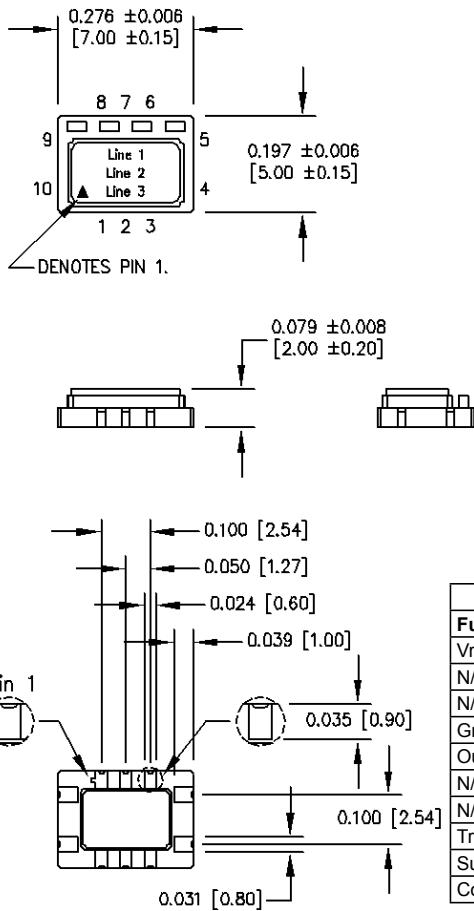
Features:

- Stratum 3 performance with hold-over stability (0.32 ppm) over industrial temperature range (-40 °C to +85 °C)
- Available in both 10 and 4/5 pads configurations
- 3.0 V, 3.3 V and 5.0 V versions
- Low phase noise and Excellent G-Sens performance: 1.5ppb/G
- Tri-state Function available

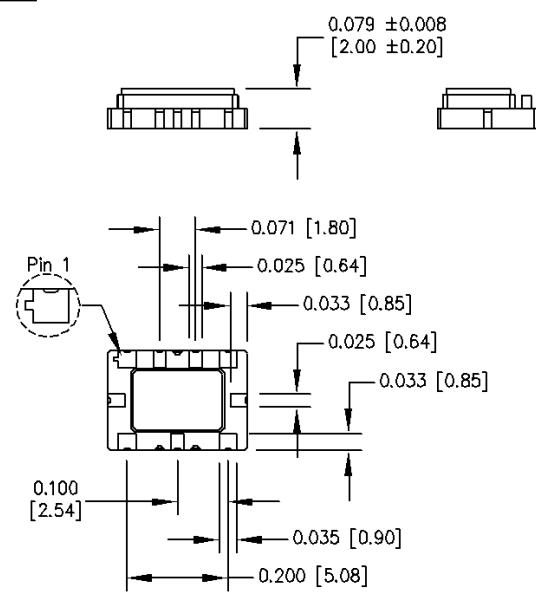
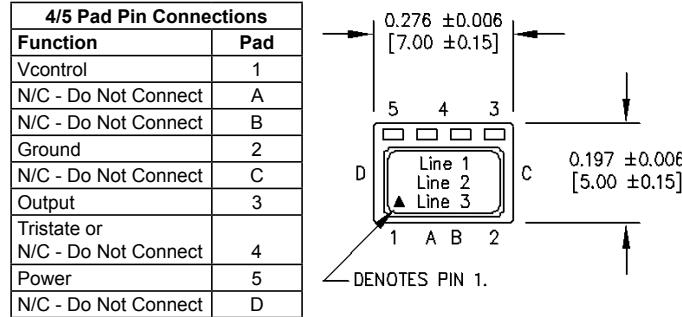
Ordering Information

Product Series	M610x	1	S	T	C	N	00.0000 MHz
M6100: 5.0 V							
M6101: 3.3 V							
M6102: 3.0 V							
Temperature Range							
1: 0°C to +70°C	8: 0°C to +50°C						
2: -40°C to +85°C	F: -30°C to +75°C						
6: -20°C to +70°C							
Stability							
S: ±4.6 ppm w/ Holdover							
Output Type							
T: Voltage Controlled With Tristate							
F: No Voltage Control With Tristate							
Output Waveform							
C: HCMOS							
S: Clipped Sine Wave							
Package/Lead Configurations							
N: 10 Pad Leadless Ceramic	T: 4/5 Pad Leadless Ceramic						
Frequency (customer specified)							

Package Code N (10 Pad)



Package Code T (4/5 Pad)



All measurements are in inches (mm). For Suggested Solder Pad Layouts, please see full datasheets at www.mtronpti.com.

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M610x Series Stratum 3
5 x 7 mm, 3.0, 3.3 & 5.0 Volt, HCMOS or Clipped Sinewave,
Precision TCXO/TCVCXO



Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions/Notes
Frequency Range	F_o	8		52	MHz	Contact factory above 40 MHz
Operating Temperature	T_A	-40		+85	°C	See Ordering Information
Storage Temperature	T_{STG}	-55		+125	°C	
Frequency Tolerance @ +25 °C		-1.0		+1.0	ppm	For TCXO only
Frequency Stability		-0.28 -4.6 -0.32		+0.28 +4.6 +0.32	ppm ppm ppm	Stability vs. Temperature Overall stability for 10 years Holdover stability for 24 hours over operating temperature
Stability Vs. Reflow		-1.0		+1.0	ppm	
Frequency Vs. Supply			± 0.02	± 0.1	ppm	For 5% supply voltage variation
Frequency Vs. Load			± 0.02	± 0.1	ppm	For 5% load variation
Supply Voltage Tolerance		-5.0		+5.0	%	See Ordering Information
Supply Current (I_o)			2.2 3.5 6.0 1.5 1.8 3.0	3.3 5.0 9.2 2.2 2.7 4.5	mA mA mA mA mA mA	HCMOS output at 13 MHz HCMOS output at 26 MHz HCMOS output at 52 MHz Clipped sinewave output at 13 MHz Clipped sinewave output at 26 MHz Clipped sinewave output at 52 MHz
Output Logic Levels (HCMOS)	V_{OL} V_{OH}	80		20	% V_s % V_s	$I_{OH}/I_{OL} = \pm 4$ mA, $V_s = +3.0$ V $I_{OH}/I_{OL} = \pm 4$ mA, $V_s = +3.0$ V
Output Level (Clipped Sinewave)		1.0 0.8			V_{pk-pk} V_{pk-pk}	$F_o \leq 40$ MHz $F_o > 40$ MHz
Waveform Symmetry		40		60	%	Ref. to $\frac{1}{2} V_s$. HCMOS only
Rise/Fall Time				8	ns	Ref. 10% to 90%. HCMOS only
Output Load			15 10/10		pF Kohm/pF	HCMOS output Clipped sinewave output
Frequency Adjustment		± 9.2			ppm	Over Control Voltage Range
Control Voltage Range		0.3 0.3 0.5		2.7 3.0 4.5	Volts Volts Volts	For $V_s = 3.0$ For $V_s = 3.3$ For $V_s = 5.0$
Input Leakage Current		-50		+50	µA	
Input Resistance		100			Kohm	
Linearity				3	%	
Modulation Bandwidth		2			kHz	
Tristate Function		70			% V_s	Output enabled. Logic "1" or "Open"
				30	% V_s	Output disabled. Logic "0" or "GND"
Tristate Leakage Current		-100		+100	µA	
Phase Noise (Typical 10 MHz CMOS)			-95 -125 -145 -152 -155		dBc/Hz	10 Hz Offset 100 Hz Offset 1 kHz Offset 10 kHz Offset 100 kHz Offset
Environmental	Shock	MIL-STD-202, Method 213, Condition C				100 g
	Vibration	MIL-STD-202, Methods 201 & 204				10 g from 10 to 2000 Hz
	Solderability	EIAJ-STD-002				
	Package	5.0 x 7.0 x 2.0 mm, SMT				RoHS Compliant
	Max Soldering Conditions	See solder profile				

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M611x Series

5 x 7 mm, 3.0, 3.3 & 5.0 Volt, HCMOS or Clipped Sinewave,
Precision TCXO/TCVCXO



N (10 Pad)
Package Option



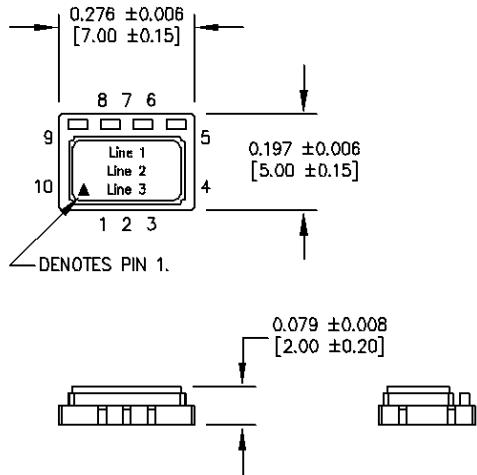
Features:

- Tight stability performance
- (+/-0.3 ppm) over Industrial Temperatures (-40 °C to +85 °C)
- (+/-0.2ppm) over Commercial Temperatures (0 to 70C)
- Available in both 10 and 4/5 pads configurations
- 3.0 V, 3.3 V and 5.0 V versions
- Low phase noise and Excellent G-Sens performance: 1.5ppb/G
- Tri-state Function available

Ordering Information

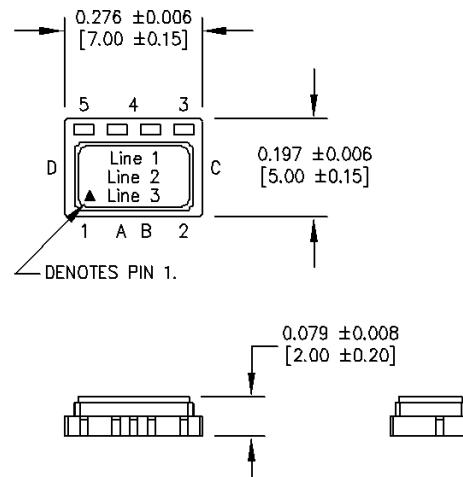
Product Series	M611x	1	J	T	C	N	00.0000 MHz
M6110: 5.0 V							
M6111: 3.3 V							
M6112: 3.0 V							
Temperature Range							
1: 0°C to +70°C	8: 0°C to +50°C						
2: -40°C to +85°C	F: -30°C to +75°C						
6: -20°C to +70°C							
Stability							
P: ±0.3 ppm	K: ±2.0 ppm	M: ±0.2 ppm					
G: ±0.5 ppm	H: ±2.5 ppm						
J: ±1.0 ppm	L: ±4.6 ppm						
Output Type							
T: Voltage Controlled With Tristate							
F: No Voltage Control With Tristate							
Output Waveform							
C: HCMOS							
S: Clipped Sine Wave							
Package/Lead Configurations							
N: 10 Pad Leadless Ceramic	T: 4/5 Pad Leadless Ceramic						
Frequency (customer specified)							

Package Code N (10 Pad)



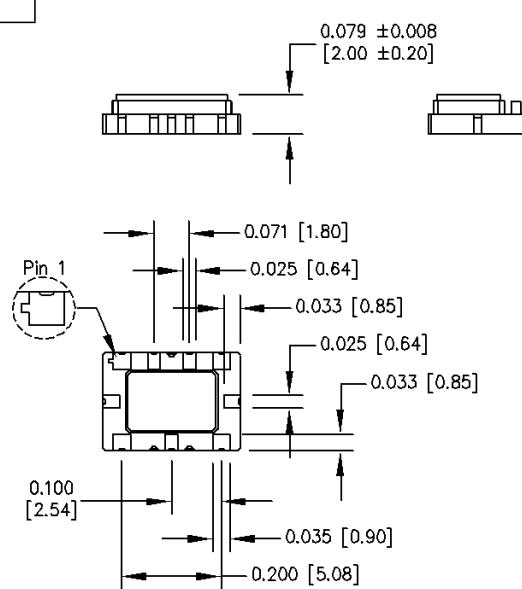
Package Code T (4/5 Pad)

4/5 Pad Pin Connections	
Function	Pad
Vcontrol	1
N/C - Do Not Connect	A
N/C - Do Not Connect	B
Ground	2
N/C - Do Not Connect	C
Output	3
Tristate or N/C - Do Not Connect	4
Power	5
N/C - Do Not Connect	D



10 Pad Pin Connections	
Function	Pad
Vref or N/C*	1
N/C - Do Not Connect	2
N/C - Do Not Connect	3
Ground	4
Output	5
N/C - Do Not Connect	6
N/C - Do Not Connect	7
Tristate	8
Supply Voltage (V _s)	9
Control Voltage	10

*Vref is not available for stabilities less than ±1.0 ppm



All measurements are in inches (mm). For Suggested Solder Pad Layouts, please see full datasheets at www.mtronpti.com.

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Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions/Notes
Frequency Range	F_o	8		52	MHz	Contact factory above 40 MHz
Operating Temperature	T_A	-40		+85	°C	See Ordering Information
Storage Temperature	T_{STG}	-55		+125	°C	
Frequency Tolerance @ +25°C		-1.0		+1.0	ppm	For TCXO only
Frequency Stability				See Ordering Information		(Fmax – Fmin)/2
Stability Vs. Reflow		-1.0		+1.0	ppm	
Frequency Vs. Supply			±0.02	±0.1	ppm	For 5% supply voltage variation
Frequency Vs. Load			±0.02	±0.1	ppm	For 5% load variation
Aging (First Year)		-1.0		+1.0	ppm	$F_o \leq 20$ MHz
Aging (First Year)		-2.0		+2.0	ppm	$F_o \geq 20$ MHz
Aging (10 Year)		-3.0		+3.0	ppm	$F_o \leq 20$ MHz (Includes first year)
Aging (10 Year)		-5.0		+5.0	ppm	$F_o > 20$ MHz (Includes first year)
Supply Voltage Tolerance		-5.0		+5.0	%	See Ordering Information
Electrical Specifications	Supply Current (I_D)		2.2	3.3	mA	HCMOS output at 13 MHz
			3.5	5.0	mA	HCMOS output at 26 MHz
			6.0	9.2	mA	HCMOS output at 52 MHz
			1.5	2.2	mA	Clipped sinewave output at 13 MHz
			1.8	2.7	mA	Clipped sinewave output at 26 MHz
			3.0	4.5	mA	Clipped sinewave output at 52 MHz
Output Logic Levels (HCMOS)	V_{OL} V_{OH}	80		20	% V_S % V_S	$I_{OH}/I_{OL} = \pm 4$ mA, $V_S = +3.0$ V $I_{OH}/I_{OL} = \pm 4$ mA, $V_S = +3.0$ V
Output Level (Clipped Sinewave)		1.0 0.8			V_{pk-pk} V_{pk-pk}	$F_o \leq 40$ MHz $F_o > 40$ MHz
Waveform Symmetry		40		60	%	Ref. to $\frac{1}{2} V_S$ HCMOS only
Rise/Fall Time				8	ns	Ref. 10% to 90%. HCMOS only
Output Load			15 10/10		pF Kohm/pF	HCMOS output Clipped sinewave output
Frequency Adjustment		±9.2			ppm	Over Control Voltage Range
Control Voltage Range		0.3 0.3 0.5		2.7 3.0 4.5	Volts	For $V_S = 3.0$ For $V_S = 3.3$ For $V_S = 5.0$
Input Leakage Current		-50		+50	µA	
Input Resistance		100			Kohm	
Linearity				3	%	
Modulation Bandwidth		2 kHz				
Tristate Function		70			% V_S	Output enabled. Logic "1" or "Open"
				30	% V_S	Output disabled. Logic "0" or "GND"
Tristate Leakage Current		-100		+100	µA	
Phase Noise (Typical 10 MHz CMOS)			-95 -125 -145 -152 -155		dBc/Hz	10 Hz Offset 100 Hz Offset 1 KHz Offset 10 KHz Offset 100 KHz Offset
Environmental	Shock	MIL-STD-202, Method 213, Condition C			100 g	
	Vibration	MIL-STD-202, Methods 201 & 204			10 g from 10 to 2000 Hz	
	Solderability	EIAJ-STD-002				
	Package	5.0 x 7.0 x 2.0 mm, SMT			RoHS Compliant	
	Max Soldering Conditions	See solder profile				

M616x Series

5 x 7 mm, 3.0, 3.3 & 5.0 Volt, HCMOS or Clipped Sinewave,
Precision TCXO/TCVCXO



N (10 Pad)
Package Option



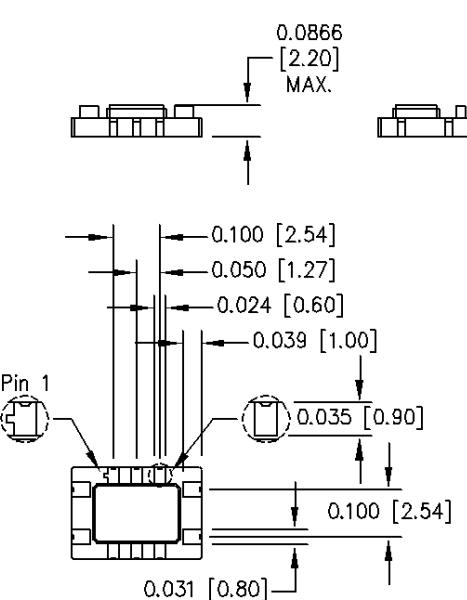
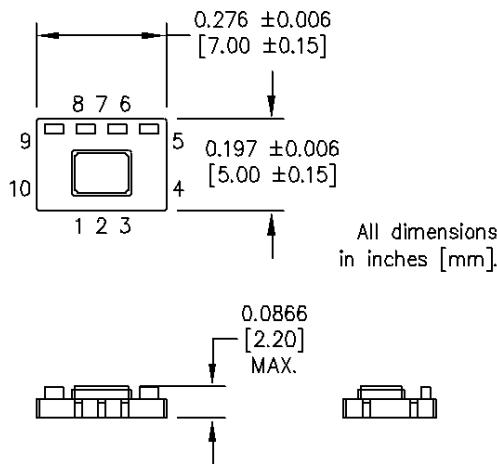
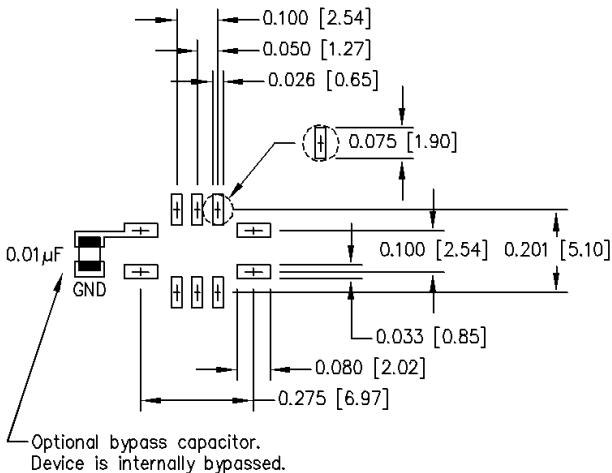
- Tight stability performance (0.2 ppm) over Industrial Temperatures (-40°C to +85°C) (0.10 ppm) over Commercial Temperatures (0°C to 70°C)
- Available in 10 pad and 14 DIP configurations (Contact factory for 14 DIP)
- 3.0 V, 3.3 V and 5.0 V versions
- Low phase noise performance
- Tri-state Function standard
- Low G-sensitivity (0.6 ppb/G) version available

Ordering Information		00.0000 MHz
Product Series	M616x	1
M6160: 5.0 V	J	T
M6161: 3.3 V	T	C
M6162: 3.0 V	C	T
M6163: 5.0 V Low G		
M6164: 3.3 V Low G		
M6165: 3.0 V Low G		
Temperature Range		
1: 0°C to +70°C	8: 0°C to +50°C	
2: -40°C to +85°C	F: -30°C to +75°C	
6: -20°C to +70°C		
Stability		
L: ±4.6 ppm	J: ±1.0 ppm	M: ±0.2 ppm
H: ±2.5 ppm	G: ±0.5 ppm	Q: ±0.14 ppm
K: ±2.0 ppm	P: ±0.3 ppm	N: ±0.10 ppm
Output Type		
T: Voltage Controlled With Tristate		
F: No Voltage Control With Tristate		
Output Waveform		
C: HCMOS		
S: Clipped Sine Wave		
Package/Lead Configurations		
N: 10 Pad Leadless Ceramic	D: 14 DIP	
Frequency (customer specified)		

M6160Sxxx, M6161Sxxx, M6162Sxxx, M6163Sxxx, M6164Sxxx & M6165Sxxx - Contact factory for datasheets.

Pin Connections	
Function	Pad
N/C - Do Not Connect	1
N/C - Do Not Connect	2
N/C - Do Not Connect	3
Ground	4
Output	5
N/C - Do Not Connect	6
N/C - Do Not Connect	7
Tristate	8
Supply Voltage (V _s)	9
Control Voltage	10

SUGGESTED SOLDER PAD LAYOUT



M616x Series

5 x 7 mm, 3.0, 3.3 & 5.0 Volt, HCMOS or Clipped Sinewave,
Precision TCXO/TCVCXO



Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions/Notes
Frequency Range	F_o	8		52	MHz	Contact factory above 40 MHz
Operating Temperature	T_A	-40		+85	°C	See Ordering Information
Storage Temperature	T_{STG}	-55		+125	°C	
Frequency Tolerance @ +25 °C		-1.0		+1.0	ppm	For TCXO only
Frequency Stability				See Ordering Information		(Fmax – Fmin)/2
Stability Vs. Reflow		-1.0		+1.0	ppm	
Frequency Vs. Supply			±0.02	±0.1	ppm	For 5% supply voltage variation
Frequency Vs. Load			±0.02	±0.1	ppm	For 5% load variation
Aging (First Year)		-1.0		+1.0	ppm	$F_o \leq 20$ MHz
Aging (First Year)		-2.0		+2.0	ppm	$F_o > 20$ MHz
Aging (10 Year)		-3.0		+3.0	ppm	$F_o \leq 20$ MHz (Includes first year)
Aging (10 Year)		-5.0		+5.0	ppm	$F_o > 20$ MHz (Includes first year)
Supply Voltage Tolerance		-5.0		+5.0	%	See Ordering Information
Supply Current (I_o)		2.0		3.0	mA	HCMOS output at 13 MHz
		3.0		4.0	mA	HCMOS output at 26 MHz
		5.5		6.5	mA	HCMOS output at 52 MHz
		1.3		1.9	mA	Clipped sinewave output at 13 MHz
		1.7		2.3	mA	Clipped sinewave output at 26 MHz
		2.8		3.5	mA	Clipped sinewave output at 52 MHz
Output Logic Levels (HCMOS)	V_{OL} V_{OH}	80		20	% V_S % V_S	$I_{OH}/I_{OL} = \pm 4$ mA, $V_S = +3.0$ V $I_{OH}/I_{OL} = \pm 4$ mA, $V_S = +3.0$ V
Output Level (Clipped Sinewave)		1.0 0.8			V_{pk-pk} V_{pk-pk}	$F_o \leq 40$ MHz $F_o > 40$ MHz
Waveform Symmetry		40		60	%	Ref. to $\frac{1}{2} V_S$. HCMOS only
Rise/Fall Time				6.5	ns	Ref. 10% to 90%. HCMOS only
Output Load			15 10/10		pF Kohm/pF	HCMOS output Clipped sinewave output
Frequency Adjustment		-5.0		+5.0	ppm	Over Control Voltage Range
G-Sensitivity			0.6		ppb/g	
Control Voltage Range		0.3		2.7	Volts	For $V_S = 3.0$
		0.3		3.0	Volts	For $V_S = 3.3$
		0.5		4.5	Volts	For $V_S = 5.0$
Input Leakage Current		-50		+50	µA	
Input Resistance		100			Kohm	
Linearity				5	%	
Modulation Bandwidth		2 kHz				
Tristate Function		70			% V_S	Output enabled. Logic "1" or "Open"
				30	% V_S	Output disabled. Logic "0" or "GND"
Tristate Leakage Current		-100		+100	µA	
Phase Noise (Typical 20 MHz CMOS)			-98 -125 -145 -154 -156		dBc/Hz	10 Hz Offset 100 Hz Offset 1 kHz Offset 10 kHz Offset 100 kHz Offset
					dBc/Hz	
					dBc/Hz	
					dBc/Hz	
					dBc/Hz	
Environmental	Shock	MIL-STD-202, Method 213, Condition C				100 g
	Vibration	MIL-STD-202, Methods 201 & 204				10 g from 10 to 2000 Hz
	Solderability	EIAJ-STD-002				
	Package	5.0 x 7.0 mm, SMT and DIP				RoHS Compliant
	Max Soldering Conditions	See solder profile				

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M630x Series

5x7 mm, 3.3/2.5/1.8 Volt, LVPECL/LVDS/CML/CMOS, TCXO/TCVCXO

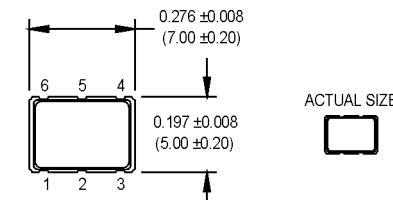


Features:

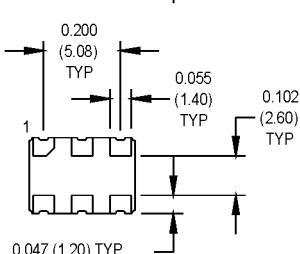
- TCXO/TCVCXO Featuring **QiK Chip™** Technology
- Superior Jitter Performance (comparable to SAW based)
- Frequencies from 50 MHz to 1.4 GHz
- Designed for a short 2 week cycle time

Applications:

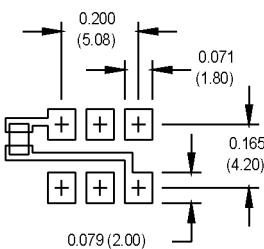
- Telecommunications such as SONET / SDH / DWDM / FEC / SERDES / OC-3 thru OC-192
- Wireless base stations / WLAN / Gigabit Ethernet
- Avionic flight controls and military communications



All dimensions
In inches (mm).



SUGGESTED SOLDER PAD LAYOUT



Ordering Information

Product Series	M630x	1	J	B	T	P	C	00.0000 MHz
M6300: 3.3 V								
M6301: 2.5 V								
M6302: 1.8 V								
Temperature Range								
1: 0°C to +70°C								
2: -40°C to +85°C								
6: -20°C to +70°C								
7: 0°C to +85°C								
8: 0°C to +50°C								
9: -30°C to +75°C								
Stability								
G: ±0.5 ppm								
J: ±1.0 ppm								
K: ±2.0 ppm								
H: ±2.5 ppm								
L: ±4.6 ppm								
E: ±10 ppm								
Enable/Disable Function								
B: Enable High (Pad 1)								
S: Enable Low (Pad 1)								
U: No Enable/Disable Function								
G: Enable High (Pad 2)								
M: Enable Low (Pad 2)								
T: Voltage Controlled With Tristate (TCXO)								
F: No Voltage Control With Tristate (VCTCXO)								
Output Waveform								
P: LVPECL								
M: CML								
Package/Lead Configurations								
N: Leadless Ceramic (9 Pad)								
C: Leadless Ceramic (6 Pad)								
Frequency (customer specified)								

PIN 1 ENABLE					
Pad1: Enable/Disable					
Pad2: N/C					
Pad3: Ground					
Pad4: Output Q (LVPECL, LVDS, CML)					
Pad5: Output Q (LVPECL, LVDS, CML)					
Pad6: Vcc					
PIN 2 ENABLE					
Pad1: N/C, V Control					
Pad2: Enable/Disable					
Pad3: Ground					
Pad4: Output Q (LVPECL, LVDS, CML)					
Pad5: Output Q (LVPECL, LVDS, CML)					
Pad6: Vcc					

Temperature vs. Stability

S	G	J	K	H	L
1	A	A	A	A	A
6	N	A	A	A	A
2	N	A	A	A	A
3	N	N	N	N	A
4	N	N	N	N	A

A = Available

N = Contact Factory

M630x Series

5x7 mm, 3.3/2.5/1.8 Volt, LVPECL/LVDS/CML/CMOS, TCXO/TCVCXO



Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions/Notes
Frequency Range	F	50 50		1400 135	MHz MHz	LVPECL, LVDS, CML (Note 4) CMOS
Operating Temperature	T _A	See Ordering Information			°C	
Storage Temperature	T _{STG}	-55		+125	°C	
Frequency Stability		See Ordering Information			ppm	See Note 1
Frequency Tolerance at +25 °C		-1.0		+1.0	ppm	
Frequency Vs. Aging		-3.0 -1.0		+ 3.0 + 1.0	ppm ppm	1 st year Per year thereafter.
Frequency Vs. Supply Voltage			± 0.4		ppm	5% voltage variation
Frequency Vs. Reflow			± 0.75		ppm	2 reflows max.
Frequency Vs. Load			± 0.2		ppm	5% supply voltage variation
Operating Voltage	V _{cc} /V _s /V _{dd}	3.135 2.375 1.71	3.3 2.5 1.8	3.465 2.625 1.89	V V V	M6300 M6301 M6302
Operating Current	I _{cc}			125 100 110 90	mA mA mA mA	LVPECL LVDS CML CMOS
Rise/Fall Time	Tr/Tf			0.35 6	ns ns	PECL, LVPECL, LVDS CMOS
Logic "1" Level	V _{OH}	V _{cc} -1.02 90% V _{dd}			V V	LVPECL CMOS
Logic "0" Level	V _{OL}			V _{cc} -1.63 10% V _{dd}	V V	LVPECL CMOS
Common Mode Output Voltage	V _{cm}		1.2		V	LVDS
Symmetry (Duty Cycle)		45 45 45		55 55 55	% % %	@ 50% Vdd (CMOS) @ 50% of waveform (LVPECL) @ 1.25 V (LVDS)
Output Voltage Level		0.7	0.95	1.2	V _{p-p}	CML
Tuning Range		± 5			ppm	VCTCXO only. See Note 2.
Voltage Control Range		0.3	1.35	3.0	V	VCTCXO. Pad 2 only.
Output Skew			20 15 20		ps ps ps	LVPECL CML LVDS
Output Load		50 Ω to (V _{cc} -2) VDC 100 Ω Differential			pF	See Note 3 LVPECL LVDS, CML
		15				CMOS
Enable/Disable Function		80%		0.5 0.5	V V	Outputs enabled (Option B or G) Outputs disabled Outputs enabled (Option S or M) Outputs disabled
Phase Noise (Typical)	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	Offset from carrier
@ 622.080 MHz (LVPECL)	-60	-90	-120	-127	-133	dBc/Hz
@ 100.000 MHz (HCMOS)	-73	-97	-123	-131	-136	dBc/Hz
@ 50.000 MHZ (HCMOS)	-80	-102	-130	-137	-141	dBc/Hz
Environmental	Shock	Per MIL-STD-202, Method 213, Condition C				
	Vibration	Per MIL-STD-202, Methods 201 & 204				
	Solderability	Per EIAJ-STD-002				
	Hermeticity	1 X 10 ⁻⁸ atm cc/sec of helium (Crystal only)				
	Thermal Shock	Per MIL-STD-883, Method 1011, Condition A				
	Thermal Cycle	Per MIL-STD-883, Method 1010, Condition B				

Note 1: Contact factory for less than ± 1ppm frequency stability.

Note 2: Contact factory for other Tuning Range options.

Note 3: See Load Circuit Diagram in this data sheet.

Note 4: Contact factory for frequencies over 945 MHz.

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M613x Series

9x14 mm, 3.0, 3.3 & 5.0 Volt, HCMOS or Clipped Sinewave

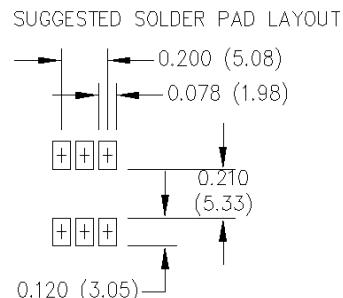
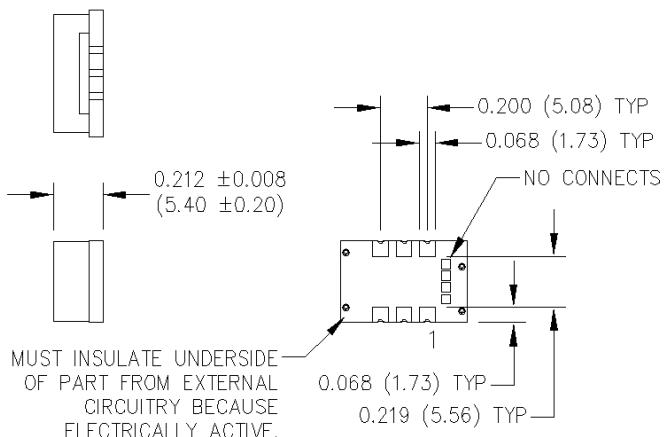
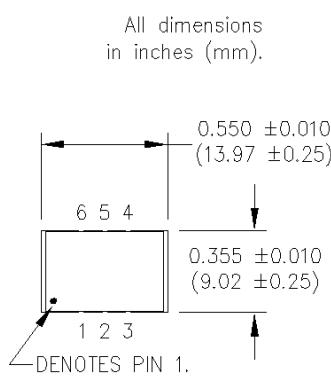
Precision TCXO/TCVCXO



- Low G sensitivity option (0.6 ppb/g)
- (Lower versions available.)
- High vibration operation (up to 20g)
- High shock operation
- Frequency: 8 - 130 MHz

Ordering Information		00.0000 MHz
Product Series	M6131	1
M6130: 5.0 V	M6133: 5.0 V Low G	J
M6131: 3.3 V	M6134: 3.3 V Low G	T
M6132: 3.0 V	M6135: 3.0 V Low G	C
Temperature Range		N
1: 0°C to +70°C	8: 0°C to +50°C	00.0000 MHz
2: -40°C to +85°C	F: -30°C to +75°C	
6: -20°C to +70°C		
Stability		
L: ±4.6 ppm	J: ±1.0 ppm	M: ±0.2 ppm
H: ±2.5 ppm	G: ±0.5 ppm	
K: ±2.0 ppm	P: ±0.3 ppm	
Output Type		
T: Voltage Controlled With Tristate*		
F: No Voltage Control With Tristate*		
Output Waveform		
C: HCMOS		
S: Clipped Sine Wave		
Package/Lead Configurations		
K: FR4 6 Pad		
Frequency (customer specified)		

* Tristate not available above 52 MHz



Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions/Notes
Frequency Range	F_O	8		130	MHz	
Operating Temperature	T_A	-40		+85	°C	See Ordering Information
Storage Temperature	T_{STG}	-55		+125	°C	
Frequency Tolerance @ +25 °C		-1.0		+1.0	ppm	For TCXO only
Frequency Stability				See Ordering Information		(Fmax – Fmin)/2
Stability Vs. Reflow		-1.0		+1.0	ppm	
Frequency Vs. Supply (±5%)			±0.02 ±1.5	±0.1 ±0.3	ppm ppm	Up to 52 MHz >52 MHz
Frequency Vs. Load (±5%)			±0.02 ±1.5	±0.1 ±0.3	ppm ppm	Up to 52 MHz >52 MHz
Aging (First Year)		-1.0		+1.0	ppm	$F_0 \leq 20$ MHz
Aging (First Year)		-2.0		+2.0	ppm	$F_0 > 20$ MHz
Aging (10 Year)		-3.0		+3.0	ppm	$F_0 \leq 20$ MHz (Includes first year)
Aging (10 Year)		-5.0		+5.0	ppm	$F_0 > 20$ MHz (Includes first year)
Supply Voltage Tolerance		-5.0		+5.0	%	See Ordering Information
Supply Current (I_D)			2.2 3.5 6.0 20 1.5 1.8 3.0	3.3 5.0 9.2 35 2.2 2.7 4.5	mA mA mA mA mA mA mA	HCMOS output at 13 MHz HCMOS output at 26 MHz HCMOS output at 52 MHz HCMOS output at 100 MHz Clipped sinewave output at 13 MHz Clipped sinewave output at 26 MHz Clipped sinewave output at 52 MHz
Output Logic Levels (HCMOS)	V_{OL} V_{OH}	80		20	% V_S % V_S	$I_{OH}/I_{OL} = \pm 4$ mA, $V_S = +3.0$ V $I_{OH}/I_{OL} = \pm 4$ mA, $V_S = +3.0$ V
Output Level (Clipped Sinewave)		1.0 0.8			V_{pk-pk} V_{pk-pk}	$F_0 \leq 40$ MHz $F_0 > 40$ MHz
Waveform Symmetry		40		60	%	Ref. to ½ V_S , HCMOS only
Rise/Fall Time				8	ns	Ref. 10% to 90%, HCMOS only
Output Load			15 10/10		pF Kohm/pF	HCMOS output Clipped sinewave output
Frequency Adjustment (Pad 1)		±9.2			ppm	Over Control Voltage Range
Control Voltage Range (Pad 1)		0.3 0.3 0.5		2.7 3.0 4.5	Volts Volts Volts	For $V_S = 3.0$ For $V_S = 3.3$ For $V_S = 5.0$
Input Leakage Current		-50		+50	µA	Pad 1
Input Resistance		100			Kohm	Pad 1
Linearity				3	%	Pad 1 Positive Slope
Modulation Bandwidth		2 kHz				Pad 1
Tristate Function (Pad 2)		70			% V_S	Output enabled. Logic "1" or "Open"
				30	% V_S	Output disabled. Logic "0" or "GND"
Tristate Leakage Current		-100		+100	µA	Pad 2
Phase Noise (Typical 10 MHz CMOS)			-95 -125 -145 -152 -155		dBc/Hz	10 Hz Offset 100 Hz Offset 1 KHz Offset 10 KHz Offset 100 KHz Offset
Environmental	Shock	MIL-STD-883, Method 2002, Condition B				
	Vibration	MIL-STD-883, Method 2007, Condition A				
	Thermal Shock	MIL-STD-883, Method 1011, Condition B				
	Moisture Resistance	MIL-STD-883, Method 1004				
	ESD Handling	JESD625 or equivalent				
	Solderability	MIL-STD-883, Method 2003				
	Package Type	6-Pad 9.02 x 13.97 x 5.4 mm, FR-4 SMT				
	Max Soldering Conditions	See solder profile				

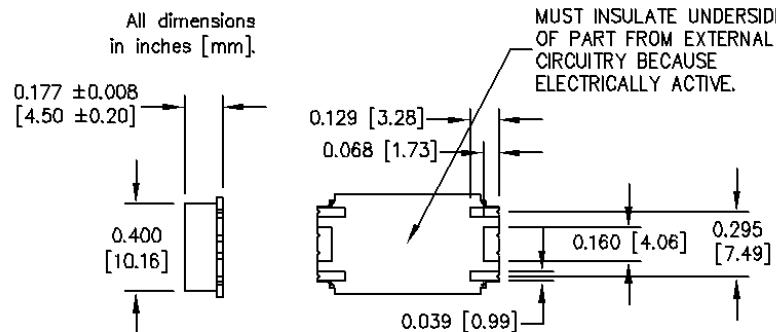
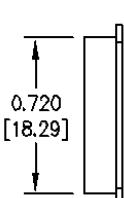
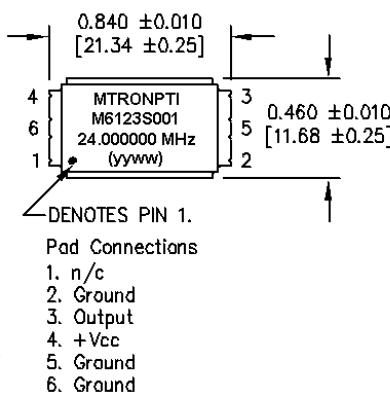
M612x Series

0.84 x 0.46 inches, 3.0, 3.3, 5.0 Volt, HCMOS or Clipped Sinewave,
SMT TCXO

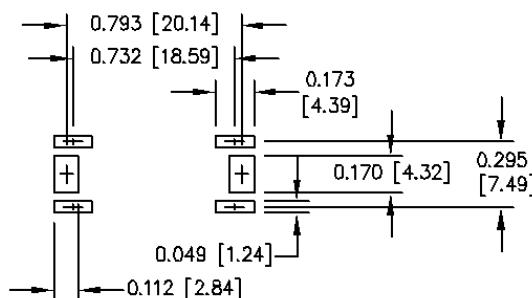


- Low G sensitivity (0.6 ppb/g typical for standard version. Lower versions available.)
- High vibration operation (up to 20g)
- High shock operation

Ordering Information		00.0000	MHz
Product Series	M611x	1	J
M6120: 5.0 V			T
M6121: 3.3 V			C
M6122: 3.0 V			N
Temperature Range			
1: 0°C to +70°C	8: 0°C to +50°C		
2: -40°C to +85°C	F: -30°C to +75°C		
6: -20°C to +70°C			
Stability			
L: ±4.6 ppm	J: ±1.0 ppm	M: ±0.2 ppm	
H: ±2.5 ppm	G: ±0.5 ppm		
K: ±2.0 ppm	P: ±0.3 ppm		
Output Type			
T: Voltage Controlled With Tristate			
F: No Voltage Control With Tristate			
Output Waveform			
C: HCMOS			
S: Clipped Sine Wave			
Package/Lead Configurations			
N: 10 Pad Leadless Ceramic	T: 4/5 Pad Leadless Ceramic		
Frequency (customer specified)			



SUGGESTED SOLDER PAD LAYOUT



M612x Series

0.84 x 0.46 inches, 3.0, 3.3, 5.0 Volt, HCMOS or Clipped Sinewave,
SMT TCXO



Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions/Notes			
Frequency Range	F_o	8		52	MHz	Contact factory above 40 MHz			
Operating Temperature	T_A	-40		+85	°C	See Ordering Information			
Storage Temperature	T_{STG}	-55		+125	°C				
Frequency Tolerance @ +25°C		-1.0		+1.0	ppm	For TCXO only			
Frequency Stability			See Ordering Information			(Fmax – Fmin)/2			
G-Sensitivity			0.6		ppb/g				
Stability Vs. Reflow		-1.0		+1.0	ppm				
Frequency Vs. Supply			±0.02	±0.1	ppm	For 5% supply voltage variation			
Frequency Vs. Load			±0.02	±0.1	ppm	For 5% load variation			
Aging (First Year)		-1.0		+1.0	ppm	$F_o \leq 20$ MHz			
Aging (First Year)		-2.0		+2.0	ppm	$F_o \geq 20$ MHz			
Aging (10 Year)		-3.0		+3.0	ppm	$F_o \leq 20$ MHz (Includes first year)			
Aging (10 Year)		-5.0		+5.0	ppm	$F_o \geq 20$ MHz (Includes first year)			
Supply Voltage Tolerance		-5.0		+5.0	%	See Ordering Information			
Supply Current (I_D)			2.2 3.5 6.0 1.5 1.8 3.0	3.3 5.0 9.2 2.2 2.7 4.5	mA	HCMOS output at 13 MHz HCMOS output at 26 MHz HCMOS output at 52 MHz Clipped sinewave output at 13 MHz Clipped sinewave output at 26 MHz Clipped sinewave output at 52 MHz			
Output Logic Levels (HCMOS)	V_{OL} V_{OH}	80		20	% V_S % V_S	$I_{OH}/I_{OL} = \pm 4$ mA, $V_S = +3.0$ V $I_{OH}/I_{OL} = \pm 4$ mA, $V_S = +3.0$ V			
Output Level (Clipped Sinewave)		1.0 0.8			V_{pk-pk} V_{pk-pk}	$F_o \leq 40$ MHz $F_o > 40$ MHz			
Waveform Symmetry		40		60	%	Ref. to $\frac{1}{2} V_S$ HCMOS only			
Rise/Fall Time				8	ns	Ref. 10% to 90%. HCMOS only			
Output Load			15 10/10		pF Kohm/pF	HCMOS output Clipped sinewave output			
Frequency Adjustment		±9.2			ppm	Over Control Voltage Range			
Control Voltage Range		0.3 0.3 0.5		2.7 3.0 4.5	Volts	For $V_S = 3.0$ For $V_S = 3.3$ For $V_S = 5.0$			
Input Leakage Current		-50		+50	µA				
Input Resistance		100			Kohm				
Linearity				3	%				
Modulation Bandwidth		2 kHz							
Tristate Function		70		% V_S		Output enabled. Logic "1" or "Open"			
			30	% V_S		Output disabled. Logic "0" or "GND"			
Tristate Leakage Current		-100		+100	µA				
Phase Noise (Typical 10 MHz CMOS)			-95 -125 -145 -152 -155		dBc/Hz	10 Hz Offset 100 Hz Offset 1 kHz Offset 10 kHz Offset 100 kHz Offset			
Environmental	Shock	MIL-STD-202, Method 213, Condition C			100 g				
	Vibration	MIL-STD-202, Methods 201 & 204			10 g from 10 to 2000 Hz				
Solderability	EIAJ-STD-002								
Package	5.0 x 7.0 x 2.0 mm, SMT					RoHS Compliant			
Max Soldering Conditions	See solder profile								

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T
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X
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XO3080 Series

1.1x0.7 inch, 3.3 & 5.0 Volt, HCMOS/Sinewave, TCXO

- All output types
- VCTCXO version available



Model	Frequency	Temperature	Temperature	Aging	Output	Supply
XO3080	(MHz)	Range (°C)	Stability	First Year		Voltage
XO3080	20	-30 to +70	±0.75 ppm	±1.0 ppm	Sine	5 V ±0.25 V
Options	10 to 125		See Table	Frequency Dependent	HCMOS	+3.3 V or +15 V

M6035Sxxx - Contact factory for datasheet.

HCMOS Load - see load circuit diagram #2.

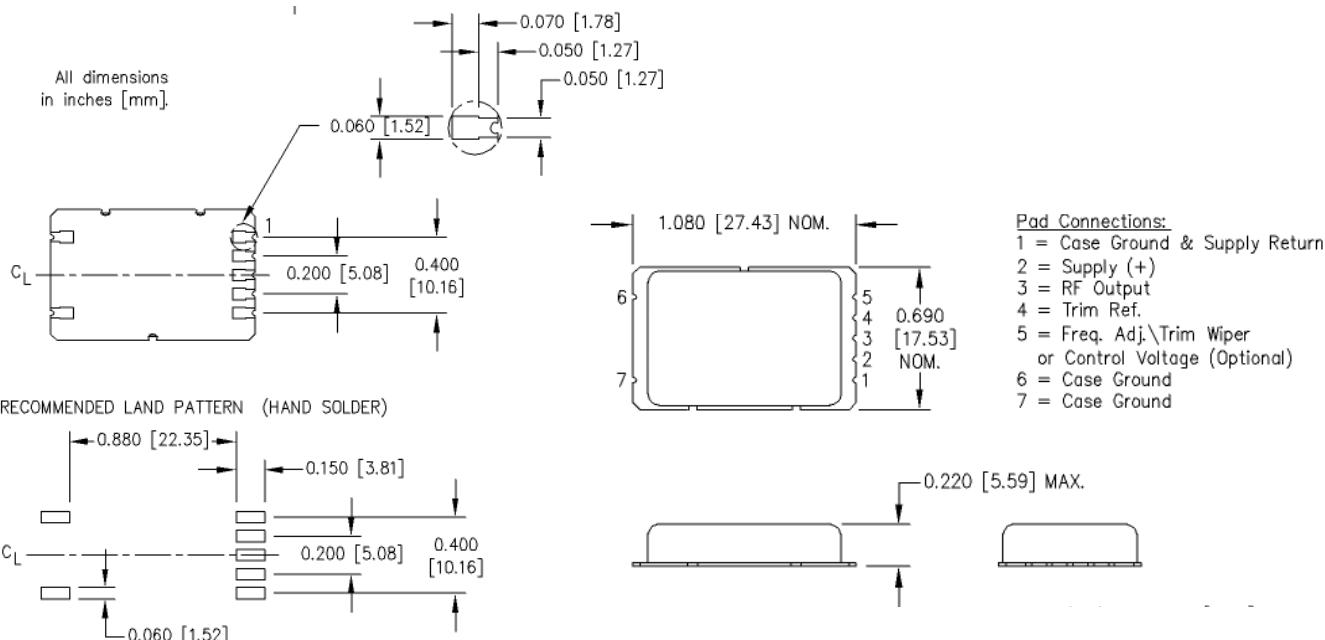
Sinewave load - see load circuit diagram #8.

Additional Specifications

Aging over ten years	±3.0 ppm max
Current	
Sinewave	As low as 2 mA
HCMOS	As low as 4 mA
Frequency Adjust	
Method	External 10 k Pot/voltage
Range	±5 ppm
Sinewave	
Level	0 dBm or 2.0 V _{p-p}
Load	50 Ω or 1 k Ω/10 pF
HCMOS	
Duty Cycle	40/60
Load	2 Gates
Phase Noise @ 20 MHz	
10 Hz	-85 dBc/Hz
100 Hz	-115 dBc/Hz
1 kHz	-135 dBc/Hz
10 kHz	-145 dBc/Hz

Range (°C)	Frequency/Temperature Stability (ppm)			
	±1	±0.75	±0.50	±0.25
+15 to +30	✓	✓	✓	✓
0 to +50	✓	✓	✓	✓
0 to +70	✓	✓	✓	✓
-20 to +70	✓	✓	✓	✓
-40 to +75	✓	✓		
-55 to +85	✓			

This TCXO can be produced to these specifications, with extended temperature range and tighter stability being cost drivers.



**Need Help in your Design?
Call us at
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VCXO Selection Guide

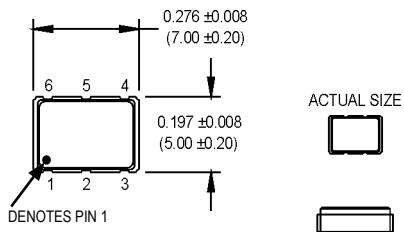
Package Size	Supply Voltage	Output Logic	Frequency Range	Family	Type	Page Number
5 x 7 mm	3.3 Volt	HCMOS	1.544 - 167 MHz	MV3	VCXO	
5 x 7 mm	5.0 Volt	HCMOS	1.544 - 50 MHz	MV5	VCXO	
5 x 7 mm	3.3 Volt	PECL/LVDS	0.750 - 800 MHz	UVV	VCXO	
5 x 7 mm	3.3 Volt	PECL/LVDS	0.750 - 800 MHz	UVVJ	VCXO	
5 x 7 mm	1.8, 2.5, 3.3 Volt	PECL/LVDS/CML	150 - 1400 MHz	M310x	VCXO	<i>QiK Chip™</i>
5 x 7 mm	1.8, 2.5, 3.3 Volt	PECL/LVDS/CML/CMOS	10 - 1400 MHz	M31x	VCXO	<i>QiK Chip™</i>
9 x 14 mm	3.3, 2.5, or 1.8 Volt	PECL/LVDS/CML	150 - 1400 MHz	M320x	VCXO	<i>QiK Chip™</i>
1.08 x 0.69 inch	3.3, 5.0 Volt	HCMOS/Sinewave	10 - 160 MHz	XO7080	VCXO	

MV3 & MV5 Series

5x7 mm, 3.3 or 5.0 Volt, HCMOS, VCXO

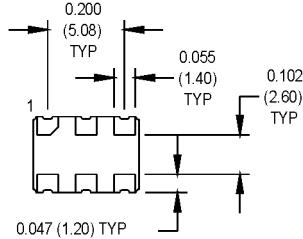
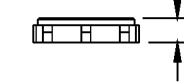


- General purpose VCXO with good performance at an affordable price

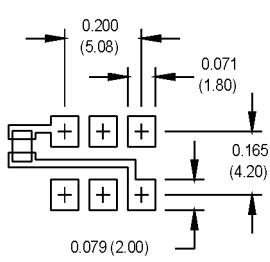


DENOTES PIN 1

0.075 (1.90) MAX



SUGGESTED SOLDER PAD LAYOUT



Pin Connections

PIN	FUNCTION
1	Control Voltage
2	N/C or Tristate
3	Ground
4	Output
5	N/C
6	+Vdd

Ordering Information						
MV3/MV5	1	3	V	C	N	00.0000 MHz
Product Series						
MV3 = 3.3 Volt						
MV5 = 5.0 Volt						
Temperature Range						
1: 0°C to +70°C	2: -40°C to +85°C					
6: -20°C to +70°C						
Stability						
3: ±100 ppm	4: ±50 ppm					
6: ±25 ppm*	8: ±20 ppm*					
Output Type						
V: Voltage Controlled - no tristate						
T: Voltage Controlled - tristate						
Symmetry/Logic Compatibility						
C: 45/55 CMOS	G: 40/60 CMOS					
Package/Lead Configurations						
N: Leadless Ceramic						
Frequency (customer specified)						

*Consult Factory for availability
M3006Sxxx & M3008Sxxx - Contact factory for datasheets.

Electrical Specifications						
PARAMETER	Symbol	Min.	Typ.	Max	Units	Condition/Notes
Frequency Range	F	1.544	1.544	167	MHz	MV3 See Note 4
				45	MHz	MV5 See Note 4
Operating Temperature	T _A	(See ordering information)				
Storage Temperature	T _S	-45		+95	°C	
Frequency Stability	ΔF/F	(See ordering information)				
Aging						
1 st Year		-3/-5		+3/+5	ppm	< 52 MHz / ≥ 52 MHz
Thereafter (per year)		-1/-2		+1/+2	ppm	< 52 MHz / ≥ 52 MHz
Pullability		+80			ppm	Over control voltage
Control Voltage	V _C	0.3	1.65	3.0	V	MV3
		0.5	2.5	4.5	V	MV5
Linearity				15	%	Positive Monotonic Slope
Modulation Bandwidth	f _M	10			kHz	-3 dB bandwidth
Input Impedance	Z _{in}	50k			Ohms	
Input Voltage	V _{dd}	3.135	3.3	3.465	V	MV3
		4.5	5.0	5.5	V	MV5
Input Current	I _{dd}				mA	
1.544 to 36 MHz				20	mA	MV3
36 to 167 MHz				50	mA	MV3
1.544 to 50 MHz				35	mA	MV5
Output Type						HCMOS
Load				15	pF	See Note 1
Symmetry (Duty Cycle)		(See ordering information)				
Logic "1" Level	V _{oh}	90			% V _{dd}	HCMOS load
Logic "0" Level	V _{ol}			10	% V _{dd}	HCMOS load
Rise/Fall Time	Tr/T _f				ns	
1.544 to 60 MHz				5	ns	See Note 2
60 to 167 MHz				2	ns	MV3
1.544 to 50 MHz				5	ns	MV5
Tristate Function		Input Logic "1" or floating: output active Input Logic "0": output disables to high-Z				
Start up Time			4		ms	
Phase Jitter	ΦJ					
20 - 45 MHz			0.5	1.0	ps RMS	See Note 3
45 - 167 MHz			3.0	5.0	ps RMS	Integrated 12 kHz - 20 MHz
Phase Noise (Typical)		10 Hz @ 19.44 MHz	100 Hz -70	1 kHz -100	10 kHz -132	100 kHz -140
					-150	Offset from carrier dBc/Hz
Mechanical Shock		Per MIL-STD-202, Method 213, Condition C				
Vibration		Per MIL-STD-202, Method 201 & 204				
Max Soldering Conditions		See solder profile, Figure 1				
Hermeticity		Per MIL-STD-202, Method 112 (1 x 10 ⁻⁵ atm cc/s of Helium)				
Solderability		Per MIL-STD-883, Method 2003				

1. HCMOS Load - See load circuit diagram #2.

2. Rise/Fall times are measured between 10% V_{dd} and 90% V_{dd} with HCMOS load.

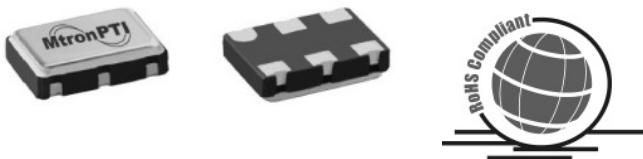
3. Contact factory for non-standard jitter requirements.

4. Contact factory for frequencies outside of the ranges shown.

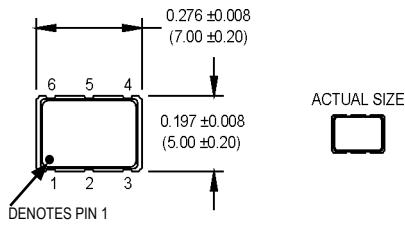
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UVV Series

5 x 7 mm, 3.3 Volt, LVPECL/LVDS, VCXO



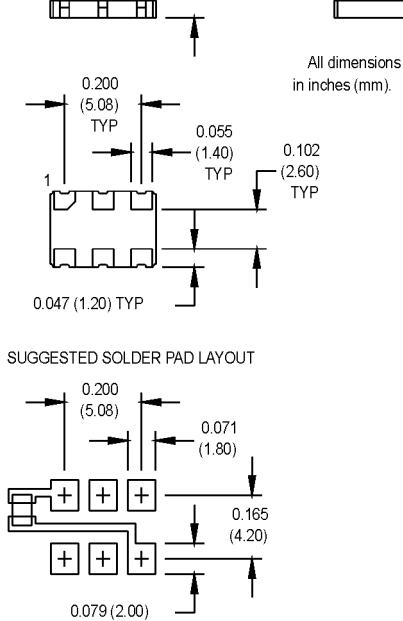
- Versatile VCXO to 800 MHz with good jitter (3 ps typical)
- Used in low jitter clock synthesizers and SONET applications



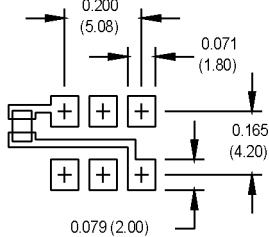
Ordering Information

Product Series	UVV	1	0	R	1	L	N	00.0000 MHz
Temperature Range								
1: 0°C to +70°C 2: -40°C to +85°C 6: -20°C to +70°C 8: 0°C to +50°C								
Stability								
0: Nominal per APR selection								
Output Type								
R: Complementary, Enable Z: Complementary, w/o Enable								
Absolute Pull Range								
1: ±50 ppm (±35 ppm typ. Stability) 2: ±100 ppm (±20 ppm typ. Stability) 5: ±80 ppm (±25 ppm typ. Stability) 8: ±25 ppm (±50 ppm typ. Stability)								
Symmetry/Output Logic Type								
L: 45/55% LVDS P: 45/55% PECL H: 40/60% LVDS Q: 40/60% PECL								
Package/Lead Configurations								
N: Leadless Ceramic (6 pads)								
Frequency (customer specified)								

M3013Sxxx - Contact factory for data sheet.



SUGGESTED SOLDER PAD LAYOUT



Pin Connections

PIN	FUNCTION
1	Control Voltage
2	Enable
3	Ground
4	Output1/ Q
5	Output2/ Q
6	+Vdd

Electrical Specifications						
PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition
Frequency Range	F	0.75		800	MHz	
Operating Temperature	TA	(See ordering information)				
Storage Temperature	TS	-55		+125	°C	
Frequency Stability	ΔF/F	(See ordering information)				
Aging		See Note 1				
1st Year		-3/-5		+3/+5	ppm	<52 MHz / ≥52 MHz
Thereafter (per year)		-1/-2		+1/+2	ppm	<52 MHz / ≥52 MHz
Pullability/APR		(See ordering information)				
Control Voltage	Vc	0.3	1.65	3	V	Pin 1 Voltage
Linearity			5	15	%	Positive Monotonic Slope
Modulation Bandwidth	fm	10			kHz	-3 dB bandwidth
Input Impedance	Zin	50k			Ohms	
Input Voltage	Vcc	3.135	3.3	3.456	V	
Input Current	Icc	See Note 1				
0.75 MHz to 24 MHz			70/30		mA	PECL/LVDS
24 MHz to 96 MHz			100/60		mA	PECL/LVDS
96 MHz to 800 MHz			110/60		mA	PECL/LVDS
Output Type		PECL/LVDS				
Load		See Note 3				
		50 Ohms to Vcc - 2 VDC				
		100 Ohms differential load				
Symmetry (Duty Cycle) (Per Symmetry Code)		Vcc - 1.3 VDC (PECL) 0.5x (Vmax-Vmin) LVDS				
(See ordering information)						
Output Skew			200		ps	PECL
Differential Voltage	Vo	250	340	450	mV	LVDS
Logic "1" Level	Voh	Vcc - 1.02			V	PECL
Logic "0" Level	Vol		Vcc - 1.63		V	PECL
Rise/Fall Time	Tr/Tf		.35	.55	ns	@ 20/80% LVPECL
			.50	1.0	ns	@ 20/80% LVDS
Enable/Disable Logic		80% Vcc min or N/C: output active 20% Vcc max: output disables to high-Z				
Start up Time			5		ms	
Phase Jitter	ΔJ		3	5	ps RMS	Integrated 12 kHz - 20 MHz
Phase Noise (Typical)		10 Hz	100 Hz	1 kHz	10 kHz	Offset from carrier
@ 19.44 MHz	-60	-90	-112	-140	-150	dBc/Hz
@ 155.52 MHz	-60	-90	-112	-123	-120	dBc/Hz
Environmental						
Mechanical Shock		Per MIL-STD-202, Method 213, Condition C				
Vibration		Per MIL-STD-202, Method 201 & 204				
Max Soldering Conditions		See solder profiles, Figure 1				
Hermeticity		Per MIL-STD-202, Method 112 (1 x 10 ⁻³ atm cc/s of helium)				
Solderability		Per MIL-STD-883, Method 2003				

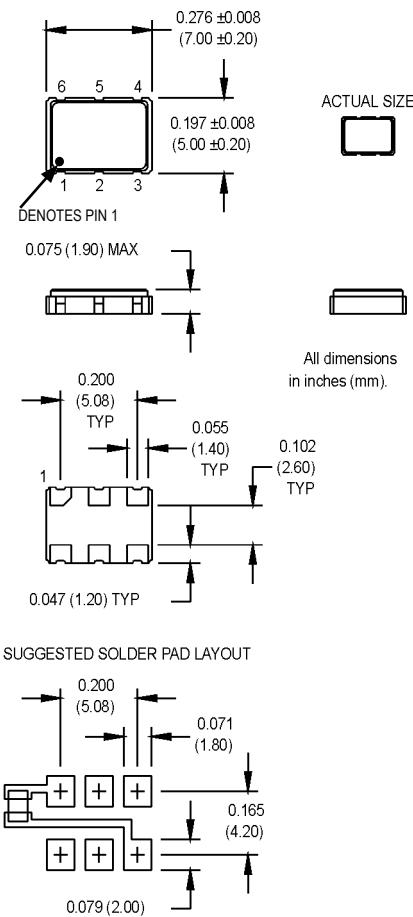
1. Stability given for deviation over temperature
2. APR specification inclusive of initial tolerance, deviation over temperature, shock, vibration, supply voltage, and aging.
3. PECL – See load circuit diagram #5. LVDS – See load circuit diagram #9.

UVVJ Series

5 x 7 mm, 3.3 or 5.0 Volt, HCMOS, VCXO



- Ultra low jitter VCXO approaching SAW jitter performance but with the temperature stability advantage of a crystal based resonator



Pin Connections

PIN	FUNCTION
1	Control Voltage
2	Output Enable
3	Ground
4	Output1/ Q
5	Output2/ \bar{Q}
6	+Vdd

Ordering Information	UVVJ	1	0	B	1	L	N	00.0000 MHz
Product Series								
Temperature Range	1: 0°C to +70°C	2: -40°C to +85°C						
	6: -20°C to +70°C	8: 0°C to +50°C						
Stability								
	0: Nominal per APR selection							
Output Type								
	B: Complementary, Enable (Enable High)							
	S: Complementary, Enable (Enable Low)							
	U: Complementary Output							
Absolute Pull Range								
	1: ±50 ppm (±35 ppm typ. Stability)							
	5: ±80 ppm (±25 ppm typ. Stability)							
	8: ±25 ppm (±50 ppm typ. Stability)							
Symmetry/Output Logic Type								
	L: 45/55% LVDS	P: 45/55% PECL						
	H: 40/60% LVDS	Q: 40/60% PECL						
Package/Lead Configurations								
	N: Leadless Ceramic (6 pads)							
Frequency (customer specified)								

M3015Sxx - Contact factory for datasheet.

PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition
Frequency Range	F	0.75	800	800	MHz	
Operating Temperature	TA	(See ordering information)				
Storage Temperature	TS	-55		+125	°C	
Frequency Stability	ΔF/F	(See ordering information)				See Note 1
Aging						
1st Year		-3/-5		+3/+5	ppm	<52 MHz / ≥52 MHz
Thereafter (per year)		-1/-2		+1/+2	ppm	<52 MHz / ≥52 MHz
Pullability/APR		(See ordering information)				See Note 2
Control Voltage	Vc	0.3	1.65	3	V	Pin 1 Voltage
Linearity			5	15	%	Positive Monotonic Slope
Modulation Bandwidth	fm	10			kHz	-3 dB bandwidth
Input Impedance	Zin	50k			Ohms	
Input Voltage	Vcc	3.135	3.3	3.456	V	
Input Current	Icc				mA	PECL/LVDS
				70/30	mA	PECL/LVDS
				100/60	mA	PECL/LVDS
Output Type						
Load			50 Ohms to Vcc –2 VDC			See Note 3
			50 Ohms differential load			PECL waveform
						LVDS waveform
Symmetry (Duty Cycle) (Per Symmetry Code)		(See ordering information)				Vcc –1.3 VDC (PECL) 0.5x (Vmax-Vmin) LVDS
Output Skew			200		ps	PECL
Differential Voltage	Vo	250	350		mV	Pk-Pk LVDS only
Logic "1" Level	Voh	Vcc –1.02			V	PECL
Logic "0" Level	Vol			Vcc –1.63	V	PECL
Rise/Fall Time	Tr/Tf		0.35	0.55	ns	@20/80% LVPECL @20/80% LVDS
			0.50	1.0	ns	
Enable/Disable Logic		80% Vcc min or N/C: output active 20% Vcc max: output disables to high-Z PECL low, GND, or N/C – enables output PECL high – disables output				Output Option B Output Option S
Start up Time			5		ms	
Phase Jitter 20 MHz to 175 MHz 175 MHz to 800 MHz	ΦJ		0.35 1.0	1.0 1.5	ps RMS ps RMS	Integrated 12 kHz – 20 MHz Integrated 12 kHz – 20 MHz
Phase Noise (Typical) @ 19.44 MHz @ 155.52 MHz @ 250.00 MHz @ 622.08 MHz	10 Hz -50 -50 -50 -50	100 Hz -80 -80 -80 -80	1 kHz -112 -100 -100 -100	10 kHz -140 -125 -124 -118	100 kHz -150 -145 -128 -121	Offset from carrier dBc/Hz dBc/Hz dBc/Hz dBc/Hz
Mechanical Shock		Per MIL-STD-202, Method 213, Condition C				
Vibration		Per MIL-STD-202, Method 201 & 204				
Max Soldering Conditions		See solder profile, Figure 1				
Hermeticity		Per MIL-STD-202, Method 112 (1 x 10 ⁻³ atm.cc/s of helium)				
Solderability		Per MIL-STD-883, Method 2003				

1. Stability given for deviation over temperature

2. APR specification inclusive of initial tolerance, deviation over temperature, shock, vibration, supply current, and aging.

3. PECL Load – See load circuit diagram #5. LVDS Load – See load circuit diagram #9

MtronPTI reserves the right to make changes to the product(s) and service(s) described herein without notice. No liability is assumed as a result of their use or application. Please see www.mtronpti.com for our complete offering and detailed datasheets. Contact us for your application specific requirements: MtronPTI 1-800-762-8800.

M310x Series

5x7 mm, 3.3/2.5/1.8 Volt, PECL/LVDS/CML, VCXO



QiK Chip™



- Featuring **QiK Chip™** Technology
- Superior Jitter Performance (comparable to SAW based)
- APR of ± 50 or ± 100 ppm over industrial temperature range
- Frequencies from 150 MHz to 1.4 GHz
- Designed for a short 2 week cycle time

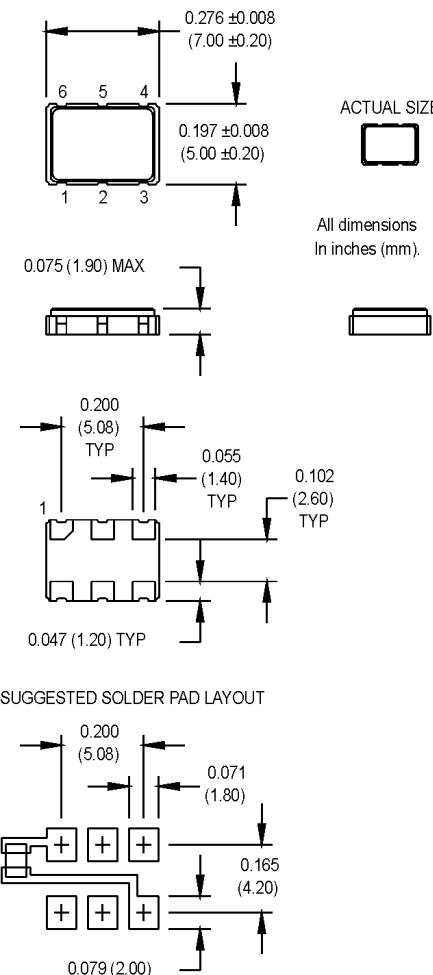
Phase Lock Loop Applications:

- Telecommunications such as SONET / SDH / DWDM / FEC / SERDES / OC-3 thru OC-192
- Wireless base stations / WLAN / Gigabit Ethernet
- Avionic flight controls and military communications

Ordering Information

M310	0	6	A	G	P	C	00.0000
Product Series							
Supply Voltage							
0: 3.3 V	1: 2.5 V						
2: 1.8 V							
Temperature Range							
2: -40°C to +85°C							
6: -20°C to +70°C							
Absolute Pull Range (APR)							
A: ± 50 ppm	B: ± 100 ppm	D: ± 200 ppm					
Enable/Disable							
G: Complementary Enable High (Pad 2)							
M: Complementary Enable Low (Pad 2)							
U: Complementary Output							
Logic Type							
P: PECL	L: LVDS						
M: CML							
Package/Lead Configuration							
C: 5x7 mm Leadless (6Pin)							
N: 5x7 mm Leadless (9 Pin - Contact Factory for availability)							
Frequency (customer specified)							

M3100Sxxx, M3101Sxxx & M3102Sxxx - Contact factory for datasheets.



- Pad1: Voltage Control
- Pad2: Enable/Disable (or N/C)
- Pad3: Ground
- Pad4: Output Q (PECL,LVDS,CML)
- Pad5: Output \bar{Q} (PECL,LVDS,CML)
- Pad6: Vcc

M310x Series

5x7 mm, 3.3/2.5/1.8 Volt, PECL/LVDS/CML, VCXO



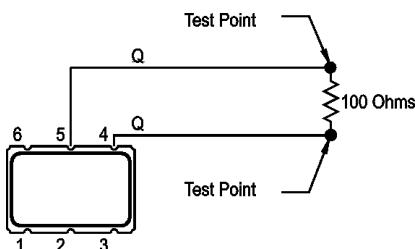
PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition/Notes
Frequency Range	F	50		1400	MHz	See Note 1
Operating Temperature	T _A	(See ordering information)				
Storage Temperature	T _S	-55		+125	°C	
Frequency Stability	ΔF/F		±25		ppm	
Aging						
1st Year		-3		+3	ppm	
Thereafter (per year)		-1		+1	ppm	
Pullability/APR		(See ordering information)				See Note 2
Gain Transfer Function			90 135 180		ppm/V ppm/V ppm/V	For ±50 ppm APR For ±100 ppm APR For ±200 ppm APR
Control Voltage	V _C	0.18 0.25 0.30	0.90 1.25 1.65	1.62 2.25 3.0	V	@ 1.8V V _C @ 2.5V V _C @ 3.3V V _C
Linearity			1	5	%	Positive Monotonic
Modulation Bandwidth	f _M	10			KHz	-3 dB bandwidth
Input Impedance	Z _{in}	500k	1M		Ohms	@ DC
Supply Voltage	V _{CC}	1.71 2.375 3.135	1.8 2.5 3.3	1.89 2.625 3.465	V	LVDS/CML
Input Current	I _{CC}			125	mA	LVPECL/LVDS/CML
Load		50 Ohms to (V _{CC} - 2) Vdc 100 Ohm differential load				See Note 3 LVPECL Waveform LVDS/CML Waveform
Symmetry (Duty Cycle)		45		55	%	LVPECL: Vdd-1.3 V LVDS: 1.25 V
Output Skew			20 15 20		ps	LVPECL CML LVDS
Differential Voltage	V _{OD}	250	350	450	mV	LVDS
	V _{OD}	0.7	0.95	1.20	V _{PP}	CML
Common Mode Output Voltage	V _{COM}		1.2		V	LVDS
Logic "1" Level	V _{OH}	V _{CC} - 1.02			V	LVPECL
Logic "0" Level	V _{OL}			V _{CC} - 1.63	V	LVPECL
Rise/Fall Time	T _R /T _F		0.23	0.35	ns	@ 20/80% LVPECL, LVDS, CML
Enable Function		80% V _{CC} min or N/C: Output active 0.5V max: Output disables to high-Z				Output Option G
		0.5V max or N/C: Output active 80% V _{CC} min: Output disables to high-Z				Output Option M
Start up Time				10	ms	
Phase Jitter @ 622.08 MHz	φJ		0.25		ps RMS	Integrated 12 kHz – 20 MHz
Environmental	Mechanical Shock	Per MIL-STD-202, Method 213, Condition C				
	Vibration	Per MIL-STD-202, Method 201 & 204				
	Max Soldering Conditions	See solder profile, Figure 1				
	Hermeticity	Per MIL-STD-202, Method 112 (1 x 10 ⁻⁸ atm cc/s of helium)				
	Solderability	Per MIL-STD-883, Method 203				

Note 1: Contact factory for standard frequency availability over 945 MHz.

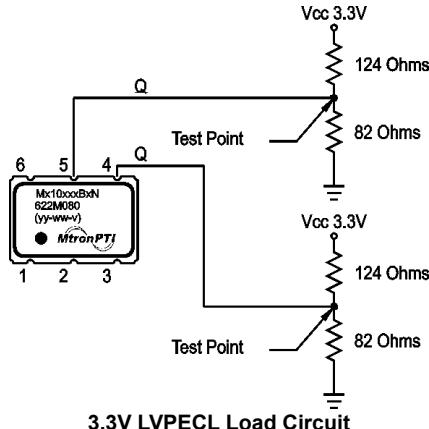
Note 2: APR specification is inclusive of initial tolerance, deviation over temperature, shock, vibration, supply voltage, and aging for one year at 50°C mean ambient temperature.

Note 3: See Load Circuit Diagram in this Datasheet. Consult factory with nonstandard output load requirements.

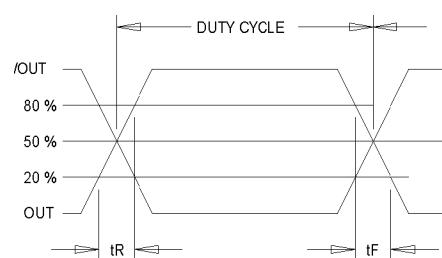
V
C
X
O



LVDS Load Circuit



3.3V LVPECL Load Circuit



Output Waveform: LVDS/CML/PECL

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M31x Series Multiple Frequency VCXO

5x7 mm, 3.3/2.5/1.8 Volt, LVPECL/LVDS/CML/HCMOS Output



Features:

- Multiple Output Frequencies (2, 3, or 4) - Selectable
- **QiK Chip™** Technology
- Superior Jitter Performance (comparable to SAW based)
- Frequencies from 50 MHz - 1.4 GHz (LVDS/LVPECL/CML) and 10 - 150 MHz (CMOS)

Phase Lock Loop Applications:

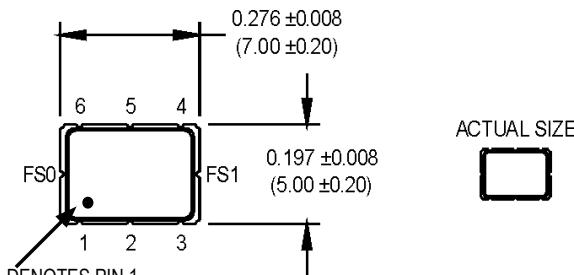
- Where more than one selectable frequency is required for different global regions, FEC (Forward Error Correction) or selectable functionality are required.
- Telecommunications such as SONET / SDH / DWDM / FEC / SERDES / OC-3 thru OC-192
- Wireless base stations / WLAN / Gigabit Ethernet
- Avionic flight controls and military communications

Ordering Information	
Product Series	M31
Number of Frequencies	X X X X X X X X
2: Two Selectable Frequencies	
3: Three Selectable Frequencies	
4: Four Selectable Frequencies	
Supply Voltage	-SXXX
0: 3.3 V	
1: 2.5 V	
2: 1.8 V	
Operating Temperature	
2: -40°C to +85°C	
6: -20°C to +70°C	
Absolute Pull Range (APR)	
A: ± 50 ppm B: ± 100 ppm D: ± 200 ppm	
Enable/Disable Function	
G: Enable High (Pad 2)	
M: Enable Low (Pad 2)	
Logic Type	
P: LVPECL	
L: LVDS	
M: CML	
C: HCMOS	
Two Frequency Select Function	
2: FSO=Pad 2	
*A: FSO=Pad A	
Package/Lead Configuration	
N: 5 x 7 mm Leadless	
Factory Assigned to Accommodate	
Customer Specified Frequencies Contact Factory	

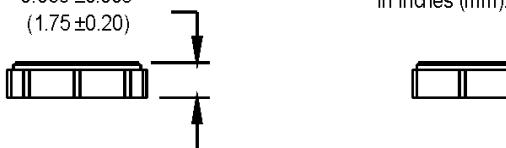
*For three and four frequency selections, FS0=Pad A.
 M3120Sxxx, M3121Sxxx, M3122Sxxx, M3130Sxxx, M3131Sxxx, M3132Sxxx,
 M3140Sxxx, M3141Sxxx, M3142Sxxx - Contact factory for datasheets.

Frequency Select Truth Table		
	FS1	FS0
Frequency 1	High	High
Frequency 2	High	Low
Frequency 3	Low	High
Frequency 4	Low	Low

NOTE: Logic Low = 20% Vcc max.
Logic High = 80% Vcc min.

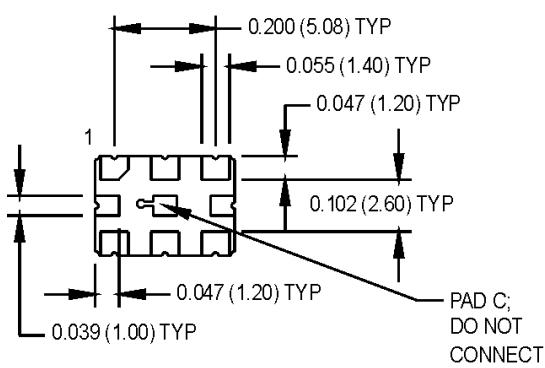


All dimensions
in inches (mm)

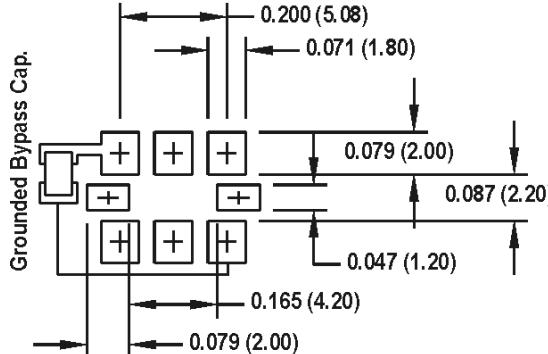


All dimensions
in inches (mm)

Pad1: Voltage Control
Pad2: Enable/Disable N/C or FS0
Pad3: Ground
Pad4: Output Q (LVPECL, LVDS, CML)
Pad5: Output \bar{Q} (LVPECL, LVDS, CML)
Pad6: Vcc
PadA: FS0 or N/C
PadB: FS1
PadC: Do not connect!



SUGGESTED USEBERT TAB EASY



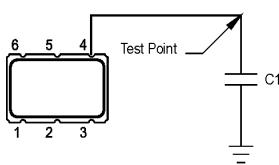
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M31x Series Multiple Frequency VCXO

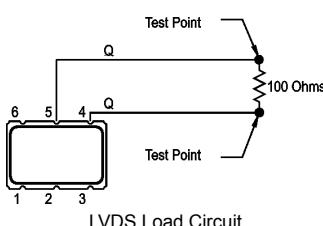
5x7 mm, 3.3/2.5/1.8 Volt, LVPECL/LVDS/CML/HCMOS Output



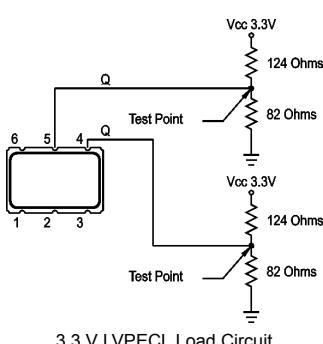
QiK Chip™



HCMOS Load Circuit



LVDS Load Circuit



3.3 V LVPECL Load Circuit

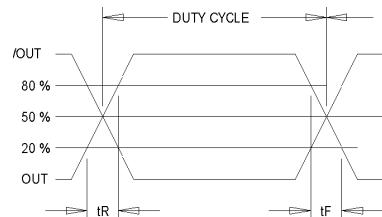
PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition/Notes
Frequency Range	F	50 10		1400 150	MHz MHz	See Note 1 LVPECL/LVDS/CML HCMOS
Operating Temperature	TA		-20°C to +70°C or -40°C to +85°C		°C	Customer Specified
Storage Temperature	Ts	-55		+125	°C	
Frequency Stability	ΔF/F		±25		ppm	
Aging 1st Year Thereafter (per year)		-3 -1		+3 +1	ppm ppm	
Pullability/APR					See Ordering Information	See Note 2
Gain Transfer Function			90 135 180		ppm/V ppm/V Ppm/V	For ± 50 ppm APR For ± 100 ppm APR For ± 200 ppm APR
Control Voltage	Vc	0.18 0.25 0.30	0.90 1.25 1.65	1.62 2.25 3.0	V V V	@ 1.8V Vcc @ 2.5V Vcc @ 3.3V Vcc
Linearity			1	5	%	Positive Monotonic
Modulation Bandwidth	fm	10			KHz	-3 dB bandwidth
Input Impedance	Zin	500k	1M		Ohms	@ DC
Supply Voltage	Vcc	1.71 2.375 3.135	1.8 2.5 3.3	1.89 2.625 3.465	V V V	
Input Current	Icc			125 80	mA mA	LVPECL/LVDS/CML HCMOS
Load			50 Ohms to (Vcc - 2) Vdc 100 Ohm differential load	15	pF	LVPECL Waveform LVDS/CML Waveform CMOS Waveform
Symmetry (Duty Cycle)		45		55	%	LVPECL: Vdd - 1.3 V LVDS: 1.25 V
Output Skew			20 15 20		ps ps ps	LVPECL CML LVDS
Differential Voltage	Vod	250	350	450	mV	LVDS
	Vod	0.7	0.95	1.20	Vpp	CML
Common Mode Output Voltage	Vcm		1.2		V	LVDS
Logic "1" Level	Voh	Vcc - 1.02 90% Vdd			V	LVPECL HCMOS
Logic "0" Level	Vol			Vcc - 1.63 10% Vdd	V	LVPECL HCMOS
Rise/Fall Time	Tr/Tf		0.23	0.35 6.0	ns ns	@ 20/80% LVPECL, LVDS, CML Ref. 10%-90% Vdd HCMOS
Enable Function Option G			80% Vcc min or N/C: Output active 0.5V max: Output disables to high-Z			Customer Specified (Pad 2)
Enable Function Option M			0.5V max or N/C: Output active 80% Vcc min: Output disables to high-Z			Customer Specified (Pad 2)
Frequency Selection			See Truth Table			
Settling Time				10	ms	To within ± 1 ppm of frequency
Start up Time				10	ms	
Phase Jitter @ 622.08 MHz @ 125 MHz	φJ φJ		0.50 1.0		ps RMS ps RMS	Integrated 12 kHz – 20 MHz HCMOS (12kHz – 20 MHz)

Environmental	Parameter	Description
	Mechanical Shock	Per MIL-STD-202, Method 213, Condition C (100 g's, 6 mS duration, ½ sinewave)
	Vibration	Per MIL-STD-202, Method 201 & 204 (10 g's from 10-2000 Hz)
	Hermeticity	Per MIL-STD-202, Method 112, (1x10 ⁻⁹ atm. cc/s of Helium)
	Thermal Cycle	Per MIL-STD-883, Method 1010, Condition B (-55°C to +125°C, 15 min. dwell, 10 cycles)
	Solderability	Per EIAJ-STD-002
	Max. Soldering Cond.	See solder profile, Figure 1

Note 1: Contact factory for standard frequency availability over 945 MHz.

Note 2: APR specification is inclusive of initial tolerance, deviation over temperature, shock, vibration, supply voltage, and aging for one year at 50°C mean ambient temperature.

Note 3: See Load Circuit Diagram in this Datasheet. Consult factory with nonstandard output load requirements.



Output Waveform: LVDS / CML / LVPECL

M320x Series

9x14 mm, 3.3/2.5/1.8 Volt, PECL/LVDS/CML, VCXO



QiK Chip™



- Featuring **QiK Chip™** Technology
- Superior Jitter Performance (comparable to SAW based)
- APR of ± 50 or ± 100 ppm over industrial temperature range
- Frequencies from 150 MHz to 1.4 GHz
- Designed for a short 2 week cycle time

Phase Lock Loop Applications:

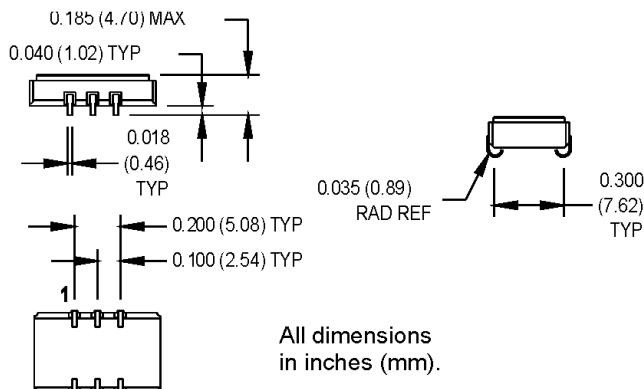
- Telecommunications such as SONET / SDH / DWDM / FEC / SERDES / OC-3 thru OC-192
- Wireless base stations / WLAN / Gigabit Ethernet
- Avionic flight controls and military communications

Ordering Information

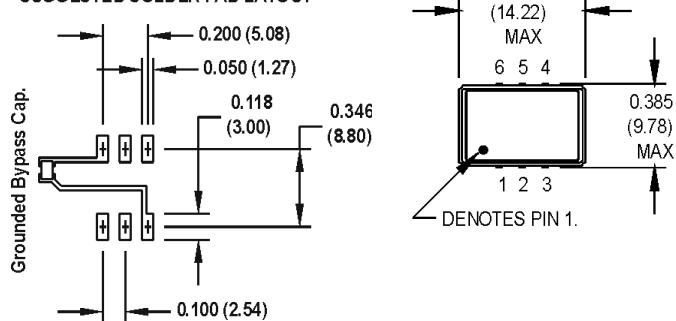
M320	0	6	A	G	P	J	00.0000
Product Series							
Supply Voltage							
0: 3.3 V	1: 2.5 V						
2: 1.8 V							
Temperature Range							
2: -40°C to +85°C	6: -20°C to +70°C						
Absolute Pull Range (APR)							
A: ± 50 ppm	B: ± 100 ppm	D: ± 200 ppm					
Enable/Disable							
G: Complementary Enable High (Pad 2)							
M: Complementary Enable Low (Pad 2)							
U: Complementary Output							
Logic Type							
P: PECL	L: LVDS						
M: CML							
Package/Lead Configuration							
J: 9x14 mm J-lead							
Frequency (customer specified)							

M3200Sxxx, M3201Sxxx & M3202Sxxx - Contact factory for datasheets.

- Pin1: Voltage Control
- Pin2: Enable/Disable (or N/C)
- Pin3: Ground
- Pin4: Output Q (PECL,LVDS,CML)
- Pin5: Output \bar{Q} (PECL,LVDS,CML)
- Pin6: Vcc



SUGGESTED SOLDER PAD LAYOUT



M320x Series

9x14 mm, 3.3/2.5/1.8 Volt, PECL/LVDS/CML, VCXO

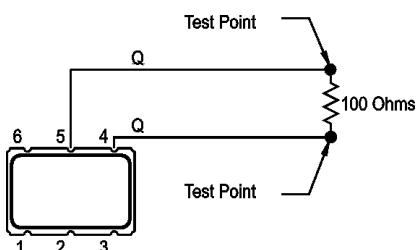


PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition/Notes
Frequency Range	F	50	1400	MHz		See Note 1
Operating Temperature	T _A	(See ordering information)				
Storage Temperature	T _S	-55		+125	°C	
Frequency Stability	ΔF/F		±25		ppm	
Aging						
1st Year		-3		+3	ppm	
Thereafter (per year)		-1		+1	ppm	
Pullability/APR		(See ordering information)				See Note 2
Gain Transfer Function		90 135 180			ppm/V ppm/V ppm/V	For ±50 ppm APR For ±100 ppm APR For ±200 ppm APR
Control Voltage	V _C	0.18 0.25 0.30	0.90 1.25 1.65	1.62 2.25 3.0	V V V	@ 1.8V V _{CC} @ 2.5V V _{CC} @ 3.3V V _{CC}
Linearity			1	5	%	Positive Monotonic
Modulation Bandwidth	f _M	10			KHz	-3 dB bandwidth
Input Impedance	Z _{IN}	500k	1M		Ohms	@ DC
Supply Voltage	V _{CC}	1.71 2.375 3.135	1.8 2.5 3.3	1.89 2.625 3.465	V V V	LVDS/CML
Input Current	I _{CC}			125	mA	LVPECL/LVDS/CML
Load		50 Ohms to (V _{CC} - 2) V _{DC} 100 Ohm differential load				See Note 3 LVPECL Waveform LVDS/CML Waveform
Symmetry (Duty Cycle)		45		55	%	LVPECL: Vdd-1.3 V LVDS: 1.25 V
Output Skew		20 15 20			ps ps ps	LVPECL CML LVDS
Differential Voltage	V _{OD}	250	350	450	mV	LVDS
	V _{OD}	0.7	0.95	1.20	V _{PP}	CML
Common Mode Output Voltage	V _{COM}		1.2		V	LVDS
Logic "1" Level	V _{OH}	V _{CC} - 1.02			V	LVPECL
Logic "0" Level	V _{OL}			V _{CC} - 1.63	V	LVPECL
Rise/Fall Time	T _R /T _F		0.23	0.35	ns	@ 20/80% LVPECL, LVDS, CML
Enable Function		80% V _{CC} min or N/C: Output active 0.5V max: Output disables to high-Z				Output Option G
		0.5V max or N/C: Output active 80% V _{CC} min: Output disables to high-Z				Output Option M
Start up Time				10	ms	
Phase Jitter @ 622.08 MHz	φJ		0.25		ps RMS	Integrated 12 kHz – 20 MHz
Environmental						
Mechanical Shock		Per MIL-STD-202, Method 213, Condition C				
Vibration		Per MIL-STD-202, Method 201 & 204				
Max Soldering Conditions		See solder profile, Figure 1				
Hermeticity		Per MIL-STD-202, Method 112 (1 x 10 ⁻⁸ atm cc/s of helium)				
Solderability		Per MIL-STD-883, Method 203				

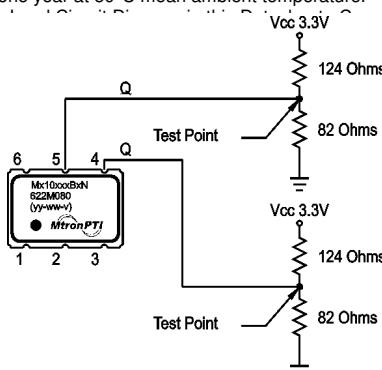
Note 1: Contact factory for standard frequency availability over 945 MHz.

Note 2: APR specification is inclusive of initial tolerance, deviation over temperature, shock, vibration, supply voltage, and aging for one year at 50°C mean ambient temperature.

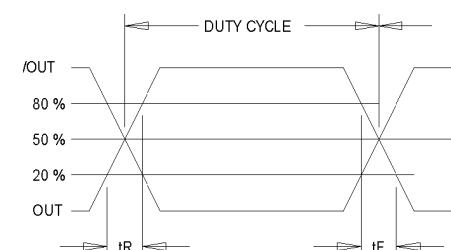
V
C
X
O



LVDS Load Circuit



3.3V LVPECL Load Circuit



Output Waveform: LVDS/CML/PECL

Electrical Specifications

Nominal Frequency (F₀): 80.0MHz

Frequency Stability

Over Temperature, $\pm 12\text{ppm}$

Aging 1st Year, $\pm 1\text{ppm}$

vs. Supply Variation ($V_{CC} \pm 10\%$), $\pm 0.5\text{ppm}$

vs. Load Variation ($50\Omega, \pm 10\%$), $\pm 0.5\text{ppm}$

All Other Causes, Excluding Temperature, for 10 Years, $\pm 5\text{ppm}$

Frequency Adjustment

Adjustment Method, External Voltage, 0 to $+5.0\text{V}_{DC}$

Adjustment Tuning Range; $\pm 25\text{ppm}$, $\pm 5\text{ppm}$ tolerance

Slope, Negative

Modulation Bandwidth, 3kHz minimum

Output (Sinewave)

Level, 0dBm, $\pm 3\text{dB}$

Load, $50\Omega, \pm 10\%$

SSB Phase Noise Under Static Conditions (maximum)

-80dBc/Hz @ 10Hz offset

-115dBc/Hz @ 100Hz offset

-140dBc/Hz @ 1kHz offset

Harmonics: -20dBc, maximum

Non-Harmonics: -90dBc, maximum

Shock (survival non-operating): -50g, 11msec $\frac{1}{2}$ sine

Vibration (survival non-operating)

$0.1g^2/\text{Hz}$, 100-2000Hz

Power Supply

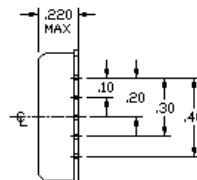
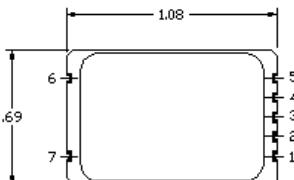
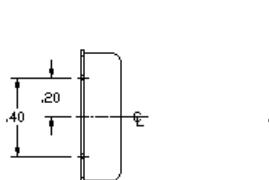
Voltage (V_{CC}), $+5.0\text{V}_{DC} \pm 10\%$

Current Consumption, 3.0ma. maximum

Temperature Range

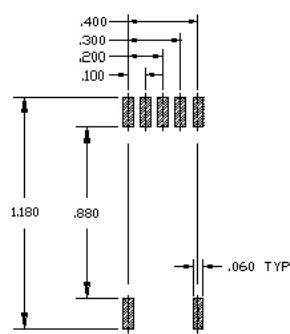
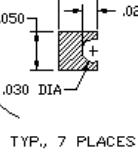
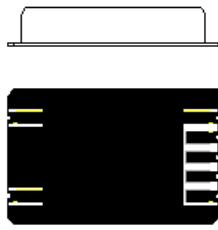
Operating, -40°C to $+85^{\circ}\text{C}$

Storage, -55°C to $+85^{\circ}\text{C}$



PIN CONNECTIONS:

1. CASE GROUND & SUPPLY RETURN
2. SUPPLY (+)
3. RF OUTPUT
4. DO NOT CONNECT
5. CONTROL VOLTAGE
6. CASE GROUND
7. CASE GROUND



Suggested Land Pattern

Oscillator is to be soldered to lands by hand with a maximum land temp of 260°C for a maximum of 3 seconds.

Note: Although the XO7080 family is an SMT device, it is not currently a reflowable assembly compatible device. Therefore, it must be hand assembled to the PCB.

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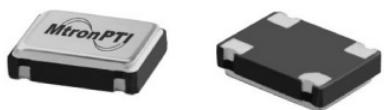
V
C
X
O

Clock Oscillator Selection Guide

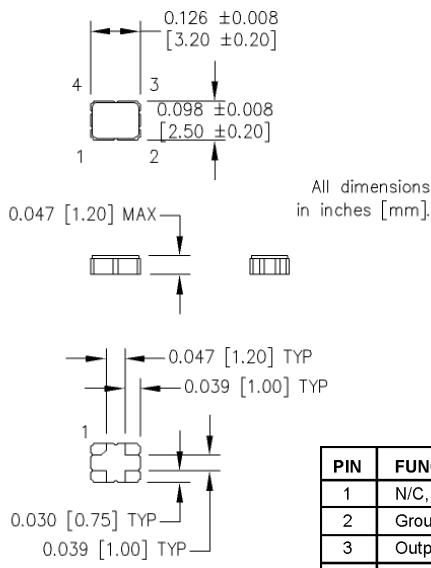
Package Size	Supply Voltage	Output Logic	Frequency Range	Family	Page Number
2.5 x 3.2 mm	3.3 Volt	HCMOS	1 - 66 MHz	M2532	
3.2 x 5 mm	2.8, 3.0, 3.3 Volt	HCMOS	1.5 - 80 MHz	M2032	
3.2 x 5 mm	2.8, 3.0, 3.3 Volt	HCMOS	1.5 - 80 MHz	M2033	
3.2 x 5 mm	2.8, 3.0, 3.3 Volt	HCMOS	1.5 - 80 MHz	M2034	
5 x 7 mm	1.8 Volt	HCMOS/TTL	1 - 70 MHz	M2180	
5 x 7 mm	2.5 Volt	HCMOS/TTL	1 - 125 MHz	M2250	
5 x 7 mm	3.3 Volt	HCMOS/TTL	1 - 135 MHz	M2	
5 x 7 mm	5.0 Volt	HCMOS/TTL	1.5 - 100 MHz	M1	
5 x 7 mm	3.0, 3.3, 3.6 Volt	HCMOS/TTL	10 - 35 MHz	M2052	
5 x 7 mm	1.8, 2.5, 3.3 Volt	LVPECL/LVDS/CML	50 - 1400 MHz	<i>QiK Chip™</i> M210x	
5 x 7 mm	1.8, 2.5, 3.3 Volt	LVPECL/LVDS/CML/ HCMOS	10 - 1400 MHz	<i>QiK Chip™</i> M21x	
5 x 7 mm	3.3 Volt	LVPECL/LVDS	.750 - 800 MHz	UVCJ	
5 x 7 mm	3.3 Volt	LVPECL/LVDS	.750 - 800 MHz	UVC	
9 x 14 mm	1.8, 2.5, 3.3 Volt	LVPECL/LVDS/CML	50 - 1400 MHz	<i>QiK Chip™</i> M220x	
9 x 14 mm			15 - 29.999 MHz	MIL PRF 55310 QPL	

M2532 Series

2.5 x 3.2 mm, 3.3 Volt, HCMOS, Clock Oscillator



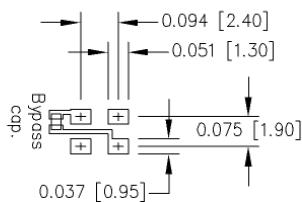
- 3.3 Volt Operation
- Standby or Tristate Option
- High density boards, low power circuits, portable test sets



Ordering Information

M2532	1	3	T	C	N	00.0000 MHz
Product Series						
Temperature Range						1: 0°C to +70°C 2: -40°C to +85°C 6: -20°C to +70°C
Stability						3: ±100 ppm 4: ±50 ppm 5: ±35 ppm 6: ±25 ppm
Output Type						F: Fixed T: Tristate Q: Standby Function
Symmetry/Logic Compatibility						G: 40/60 HCMOS C: 45/55 HCMOS
Package/Lead Configurations						N: Leadless
Frequency (customer specified)						

SUGGESTED SOLDER PAD LAYOUT



Electrical Specifications											
PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition					
Frequency Range	F	1.0		66.0	MHz	See Note 1					
Frequency Stability	ΔF/F	(See Ordering Information)									
Operating Temperature	TA	(See Ordering Information)									
Storage Temperature	TS	-55		+125	°C						
Input Voltage	Vdd		3.3		V	± 5%					
Input Current	Idd	12		20	mA	Frequency Dependent					
Standby Current				50	μA	Standby Mode					
Symmetry (Duty Cycle)		(See Ordering Information)									
Load				15	pF						
Rise/Fall Time	Tr/Tf			10	ns	10% and 90% frequency dependent					
Logic "1" Level	Voh	90% Vdd			V	HCMOS Load					
Logic "0" Level	Vol			10% Vdd	V	HCMOS Load					
Random Jitter			4	10	ps RMS	1 Sigma					
Standby/Tristate Function		Input Logic "1" or floating; output active Input Logic "0"; output to high-Z									
Environmental											
Mechanical Shock	Per MIL-STD-202, Method 213, Condition C										
Vibration	Per MIL-STD-202, Method 201 & 204										
Reflow Solder Conditions	See "Figure 2"										
Hermeticity	Per MIL-STD-202, Method 112 (1×10^{-3} atm.cc/s of helium)										
Solderability	Per EIAJ-STD-002										

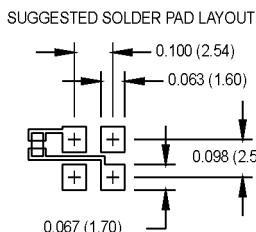
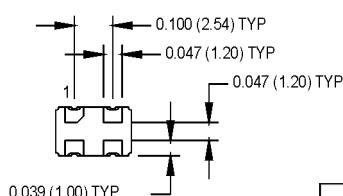
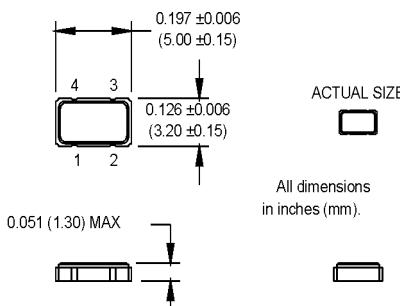
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M2032, M2033, and M2034 Series

3.2 x 5.0 x 1.3 mm HCMOS Compatible Surface Mount Oscillators



- **±20 ppm stability**
- **Tri-state or standby function**
- **Ideal for WLAN and IEEE802.11 Applications**
- **Low power applications**



PIN	Function
1	Standby/Tristate
2	Ground
3	Output
4	+Vdd

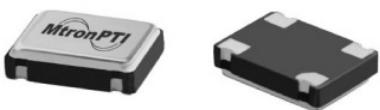
Electrical Specifications						
PARAMETER	Symbol	Min.	Typ.	Max.	Units.	Condition
Frequency Range	F	1.5		80	MHz	See Note 1
Frequency Stability	ΔF/F			±20	ppm	See Note 2
Operating Temperature	T _A	(See Ordering Information)				
Input Voltage	V _{dd}	3.15 2.85 2.7	3.3 3.0 2.85	3.45 3.15 3.0	V	3.3V 3.0V 2.8V
Input Current	I _{dd}			15 20 45	mA	3.3V
1.500 to 20.000 MHz 20.001 to 50.000 MHz 50.001 to 80.000 MHz						
Symmetry (Duty Cycle)		45		55	%	½ V _{dd}
Rise/Fall Time	Tr/T _f			6 4	ns	10% to 90% V _{dd}
22.000 to 44.000 MHz 80.000 MHz						10% to 90% V _{dd}
Logic "1" Level	V _{oh}	90% V _{dd}			V	
Logic "0" Level	V _{ol}			10% V _{dd}	V	
Output Current	I _{oh} I _{ol}	-2 +2			mA	
Output Load				15	pF	
Start-up Time			5	10	ms	
Standby Current				10	µA	
Standby/Tristate Function		Pin 1 high or floating: clock signal output Pin 1 low: output disables to high impedance				
Output Disable Time				150	ns	
Output Enable Time				5	ms	
Environmental						
Mechanical Shock	Per MIL-STD-202, Method 213, Condition C					
Vibration	Per MIL-STD-202, Method 201 & 204					
Reflow Solder Conditions	+260°C for 10 seconds maximum					
Hermeticity	Per MIL-STD-202, Method 112 (1 x 10 ⁻⁸ atm.cc/s of helium)					
Solderability	Per EIAJ-STD-002					

1. Consult factory for available frequencies in this range.

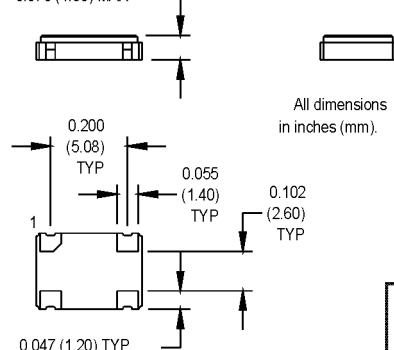
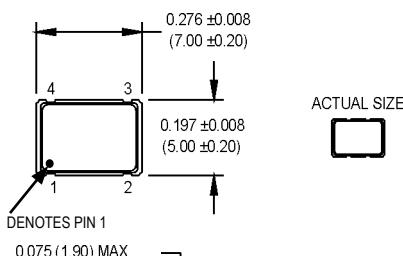
2. Inclusive of calibration, deviation over temperature, supply voltage change, load change, shock, vibration, and 10 years aging

M2180 Series

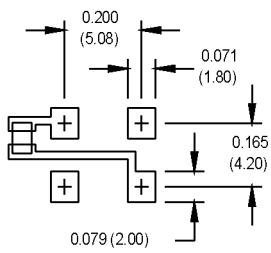
5x7 mm, 1.8 Volt, HCMOS/TTL, Clock Oscillator



- 1.8 Volt Operation
- Standby Option
- High density boards, low power circuits, portable test sets



SUGGESTED SOLDER PAD LAYOUT



PIN	FUNCTION
1	N/C, Tri-state or Standby
2	Ground
3	Output
4	+Vdd

NOTE: A capacitor of value 0.01 μ F or greater between Vdd and Ground is recommended.

Ordering Information

M2180	1	3	T	C	N	00.0000 MHz
Product Series						
Temperature Range						
1: 0°C to +70°C	2: -40°C to +85°C					
6: -20°C to +70°C						
Stability						
3: ±100 ppm	4: ±50 ppm					
5: ±35 ppm	6: ±25 ppm					
Output Type						
F: Fixed						
T: Tristate						
Q: Standby Function						
Symmetry/Logic Compatibility						
A: 40/60 TTL/HCMOS						
C: 45/55 HCMOS						
Package/Lead Configurations						
N: Leadless						
Frequency (customer specified)						

M2180Sxxx - Contact factory for datasheet.

Electrical Specifications											
PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition					
Frequency Range	F	1.0		70	MHz	See Note 1					
Frequency Stability	$\Delta F/F$	(See Ordering Information)									
Operating Temperature	T_A	(See Ordering Information)									
Storage Temperature	T_s	-55		+125	°C						
Input Voltage	Vdd	1.62	1.8	1.98	V						
Input Current	Idd			20	mA						
Standby Current				10	μ A	Standby Mode					
Symmetry (Duty Cycle)		(See Ordering Information)									
Load				30/10	pF/TTL						
Rise/Fall Time	Tr/Tf										
1.000 to 35.328 MHz				10	ns	Ref. 10% - 90% Vdd					
35.328 to 70.000 MHz				6	ns	Ref. 10% - 90% Vdd					
Logic "1" Level	Voh	90% Vdd			V	HCMOS Load					
Logic "0" Level	Vol			10% Vdd	V	HCMOS Load					
Cycle to Cycle Jitter			8	15	ps RMS	1 Sigma					
Standby/Tristate Function		Input Logic "1" or floating; output active Input Logic "0"; output to high-Z									
Mechanical Shock	Per MIL-STD-202, Method 213, Condition C										
Vibration	Per MIL-STD-202, Method 201 & 204										
Max Soldering Conditions	See solder profile, Figure 1										
Hermeticity	Per MIL-STD-202, Method 112 (1 x 10 ⁻³ atm.cc/s of helium)										
Solderability	Per EIAJ-STD-002										

1. Not all frequencies are available. Please contact factory for availability.

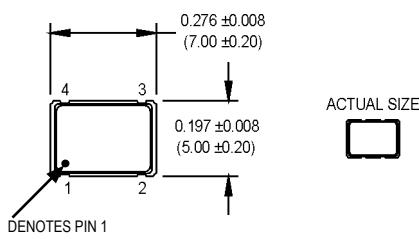
TTL Load - see load circuit diagram #1. HCMOS Load - see load circuit diagram #2.

M2250 Series

5x7 mm, 2.5 Volt, HCMOS/TTL, Clock Oscillator



- 2.5 Volt Operation
- Standby Option
- High density boards, low power circuits, portable test sets

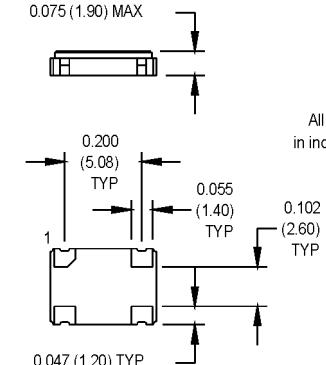


DENOTES PIN 1

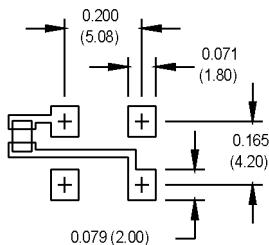
0.075 (1.90) MAX



All dimensions
in inches (mm).



SUGGESTED SOLDER PAD LAYOUT



PIN	FUNCTION
1	N/C, Tri-state or Standby
2	Ground
3	Output
4	+Vdd

NOTE: A capacitor of value 0.01 μ F or greater between Vdd and Ground is recommended.

Ordering Information

Product Series	M2250	1	3	T	C	N	00.0000
Temperature Range							MHz
1: 0°C to +70°C	2: -40°C to +85°C						
6: -20°C to +70°C							
Stability							
3: ±100 ppm	4: ±50 ppm	*8: ±20 ppm					
5: ±35 ppm	6: ±25 ppm						
Output Type							
F: Fixed							
T: Tristate							
Q: Standby Function							
Symmetry/Logic Compatibility							
A: 40/60 TTL/HCMOS							
C: 45/55 HCMOS							
Package/Lead Configurations							
N: Leadless							
Frequency (customer specified)							

* 0°C to +70°C only
M2250Sxxx - Contact factory for datasheet.

Electrical Specifications		PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition
Frequency Range		F		1.0		125	MHz	See Note 1
Frequency Stability		ΔF/F		(See Ordering Information)				
Operating Temperature		T _A		(See Ordering Information)				
Storage Temperature		T _s		-55		+125	°C	
Input Voltage		V _{dd}		2.375	2.5	2.625	V	
Input Current		I _{dd}				30	mA	
Standby Current						10	μA	Standby Mode
Symmetry (Duty Cycle)				(See Ordering Information)				
Load						15/10	pF/TTL	
Rise/Fall Time		T _r /T _f				6	ns	Ref. 0.25 - 2.25 V
Logic "1" Level		V _{oh}		90% V _{dd}			V	HCMOS Load
Logic "0" Level		V _{ol}				10% V _{dd}	V	HCMOS Load
Cycle to Cycle Jitter					8	15	ps RMS	1 Sigma
Standby/Tristate Function				Input Logic "1" or floating; output active				
				Input Logic "0"; output to high-Z				
Environmental		Mechanical Shock		Per MIL-STD-202, Method 213, Condition C				
		Vibration		Per MIL-STD-202, Method 201 & 204				
		Hermeticity		Per MIL-STD-202, Method 112 (1 x 10 ⁻⁶ atm.cc/s of helium)				
		Solderability		Per EIAJ-STD-002				
		Max Soldering Conditions		See solder profile, Figure 1				

1. Not all frequencies are available. Please contact factory for availability.

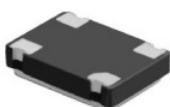
TTL Load - see load circuit diagram #1. HCMOS Load - see load circuit diagram #2.

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Call us at
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X
O

M2 Series

5x7 mm, 3.3 Volt, HCMOS/TTL Compatible Output, Clock Oscillator



Ordering Information

Product Series	M2	1	3	T	C	N	00.0000 MHz	
Temperature Range								
1: 0°C to +70°C	2: -40°C to +85°C							
3: -55°C to +105°C	4: -55°C to +125°C*							
5: -10°C to +125°C	6: -20°C to +70°C							
7: 0°C to +85°C								
Stability								
3: ±100 ppm	4: ±50 ppm							
5: ±35 ppm	6: ±25 ppm							
*8: ±20 ppm								
Output Type								
F: Fixed	Q: Standby Function	T: Tristate						
Symmetry/Logic Compatibility								
A or G: 40/60 @ 50% Vdd**								
C: 45/55 HCMOS								
Package/Lead Configurations								
N: Leadless Ceramic								
Frequency (customer specified)								

*Contact Factory for Availability

** A and G codes are used interchangeably on the M2 Series
M2002Sxxx - Contact factory for datasheet

Features:

- Leadless Chip Carrier (LCC) package
- Seam sealed package
- Tri-state or Standby function options
- Stabilities to ±20 ppm
- Fully RoHS 6 compliant

Applications:

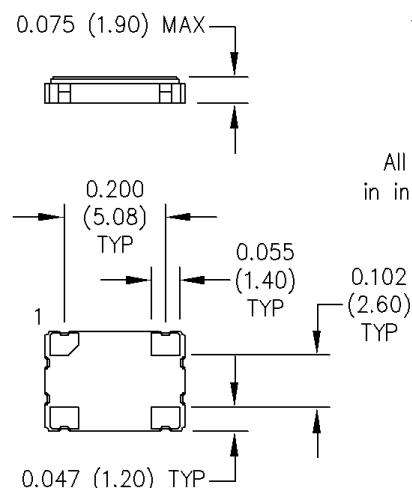
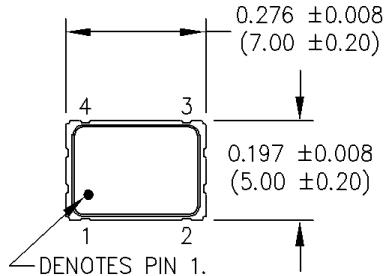
- Microprocessors/Controllers, DSP
- Gig E, SONET
- Industrial Controllers
- Broadband Access
- Test & Measurement Equipment

PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition/Notes					
Frequency Range	F	1.5		135	MHz	See Note 1					
Operating Temperature	T _A				(See ordering information)						
Storage Temperature	T _S	-55		+125	°C						
Frequency Stability	ΔF/F				(See ordering information)						
Aging 1 st Year			±3		ppm						
Thereafter (per year)			±2		ppm						
Input Voltage	V _{dd}	3.0	3.3	3.6	V						
Input Current	I _{dd}			10 20 30 55	mA	1.500 to 20.000 MHz 20.001 to 50.000 MHz 50.001 to 67.000 67.001 to 135.000 MHz					
Standby Current				10	μA	"Q" Output Type Only					
Output Type						HCMOS/TTL Compatible					
Load				15/2	PF/TTL	See Note 2					
Symmetry (Duty Cycle)						1/2 V _{dd}					
Logic "1" Level	V _{oh}	90% V _{dd}			V	HCMOS Load					
		V _{dd} - 0.5			V	TTL Load					
Logic "0" Level	V _{ol}			10% V _{dd} 0.5	V	HCMOS Load					
				V		TTL Load					
Output Current				±4	mA						
Rise/Fall Time	T _r /T _f			6 4 2	ns	See Note 3 1.500 to 50.000 MHz 50.001 to 80.000 MHz 80.001 to 135.000 MHz					
Standby/Tristate Function				Input Logic "1" or floating: output active Input Logic "0"; output disables to high-Z							
Start up Time				10	ms						
Random Jitter	R _j		4	10	ps RMS	1-Sigma					
Environmental	Mechanical Shock	Per MIL-STD-202, Method 213, Condition C (100 g's, 6 mS duration, 1/2 sinewave)									
	Vibration	Per MIL-STD-202, Method 201 & 204 (10 g's from 10-2000 Hz)									
	Hermeticity	Per MIL-STD-202, Method 112, (1x10 ⁻⁸ atm. cc/s of Helium)									
	Thermal Cycle	Per MIL-STD-883, Method 1010, Condition B (-55°C to +125°C, 15 min. dwell, 10 cycles)									
	Solderability	Per EIAJ-STD-002									
Soldering Conditions											
See solder profile, Figure 1											

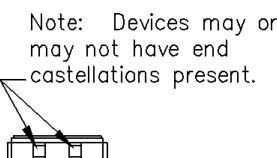
1. Consult factory for availability of higher frequencies.
2. HCMOS Load - See Load circuit diagram. Consult factory with nonstandard output load requirements.
3. Rise/Fall times are measured between 0.5 V and 2.4 V with TTL load, and between 10% V_{dd} and 90% V_{dd} with HCMOS load.

M2 Series

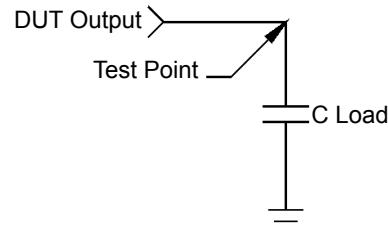
5x7 mm, 3.3 Volt, HCMOS/TTL Compatible Output, Clock Oscillator



All dimensions
in inches (mm).

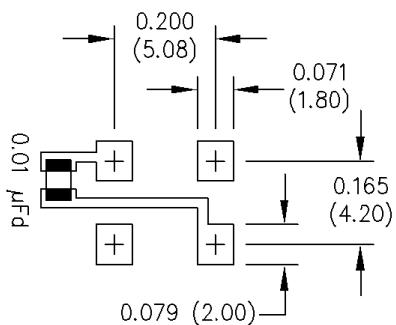


Load Circuit Diagram



Note: C Load includes probe and fixturing.

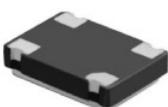
SUGGESTED SOLDER PAD LAYOUT



Pin Connections	
PIN	Function
1	N/C, Tristate or Standby
2	Ground
3	Output
4	+Vdd

M1 Series

5x7 mm, 5.0 Volt, HCMOS/TTL Compatible Output, Clock Oscillator



Features:

- Leadless Chip Carrier (LCC) package
- Seam sealed package
- Tri-state function option
- Stabilities to ± 20 ppm
- Fully RoHS 6 compliant

Applications:

- Microprocessors/Controllers, DSP
- Gig E, SONET
- Industrial Controllers
- Broadband Access
- Test & Measurement Equipment

Ordering Information							
M1	1	3	F	A	N	00.0000	MHz
Product Series							
Temperature Range							
1: 0°C to +70°C	2: -40°C to +85°C						
4: -55°C to +125°C	6: -20°C to +70°C						
Stability							
3: ± 100 ppm	4: ± 50 ppm						
5: ± 35 ppm	6: ± 25 ppm						
*8: ± 20 ppm							
Output Type							
F: Fixed	T: Tristate						
Symmetry/Logic Compatibility							
A: 40/60 TTL/HCMOS (50.000 MHz and below)							
C: 45/55 HCMOS							
G: 40/60 HCMOS (50.001 to 125.000 MHz)							
Package/Lead Configurations							
N: Leadless Ceramic							
Frequency (customer specified)							

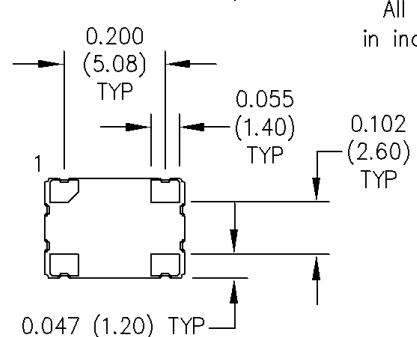
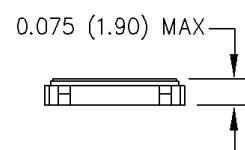
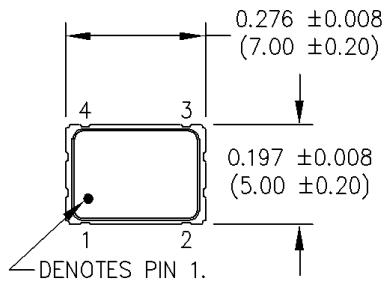
*Contact Factory for Availability
M2010Sxxx - Contact factory for datasheet.

Electrical Specifications						
PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition/Notes
Frequency Range	F	1.5		125	MHz	See Note 1
Operating Temperature	T _A	(See ordering information)				
Storage Temperature	T _S	-55		+125	°C	
Frequency Stability	ΔF/F	(See ordering information)				
Aging 1 st Year Thereafter (per year)			±3 ±2		ppm ppm	
Input Voltage	V _{dd}	4.5	5.0	5.5	V	
Input Current	I _{dd}			20 35/45 65	mA mA mA	1.5000 to 20.000 MHz 20.001 to 60.000 MHz 50.001 to 125.000 MHz
Output Type						HCMOS/TTL Compatible
Load 1.500 to 50 MHz 50.001 to 67 MHz 67.001 to 125 MHz				50/10 50 15	pF/TTL pF pF	See Note 2
Symmetry (Duty Cycle)		(See ordering information)				
Logic "1" Level	V _{oh}	90% V _{dd}		V	V	HCMOS Load TTL Load
Logic "0" Level	V _{ol}			10% V _{dd} 0.5	V V	HCMOS Load TTL Load
Output Current				±16	mA	
Rise/Fall Time	T _r /T _f			10 3	ns ns	See Note 3 1.5000 to 67.000 MHz 67.001 to 125.000 MHz
Tristate Function		Input Logic "1" or floating; output active Input Logic "0"; output disables to high-Z				
Start up Time				10	ms	
Random Jitter	R _j		5	12	ps RMS	1-Sigma
Environmental						
Mechanical Shock		Per MIL-STD-202, Method 213, Condition C (100 g's, 6 mS duration, ½ sinewave)				
Vibration		Per MIL-STD-202, Method 201 & 204 (10 g's from 10-2000 Hz)				
Hermeticity		Per MIL-STD-202, Method 112, (1x10 ⁻⁸ atm. cc/s of Helium)				
Thermal Cycle		Per MIL-STD-883, Method 1010, Condition B (-55°C to +125°C, 15 min. dwell, 10 cycles)				
Solderability		Per EIAJ-STD-002				
Max Soldering Conditions		See solder profile, Figure 1				

1. Consult factory for availability of higher frequencies.
2. HCMOS Load - See Load circuit diagram. Consult factory with nonstandard output load requirements.
3. Rise/Fall times are measured between 0.5 V and 2.4 V with TTL load, and between 10% V_{dd} and 90% V_{dd} with HCMOS load.

M1 Series

5x7 mm, 5.0 Volt, HCMOS/TTL Compatible Output, Clock Oscillator

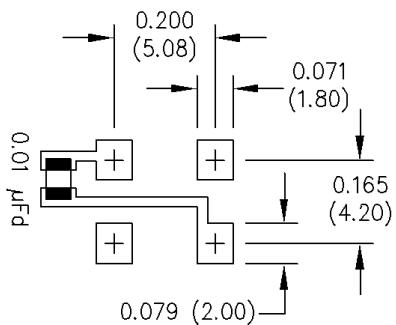


Note: Devices may or may not have end castellations present.



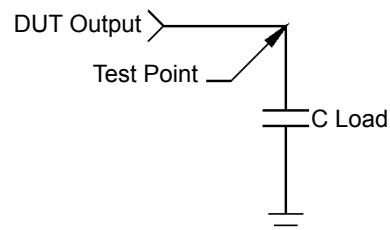
All dimensions in inches (mm).

SUGGESTED SOLDER PAD LAYOUT



Pin Connections	
Pin	Function
1	N/C or Tristate
2	Ground
3	Output
4	+Vdd

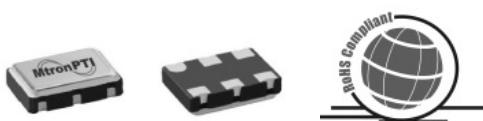
Load Circuit Diagram



Note: C Load includes probe and fixturing.

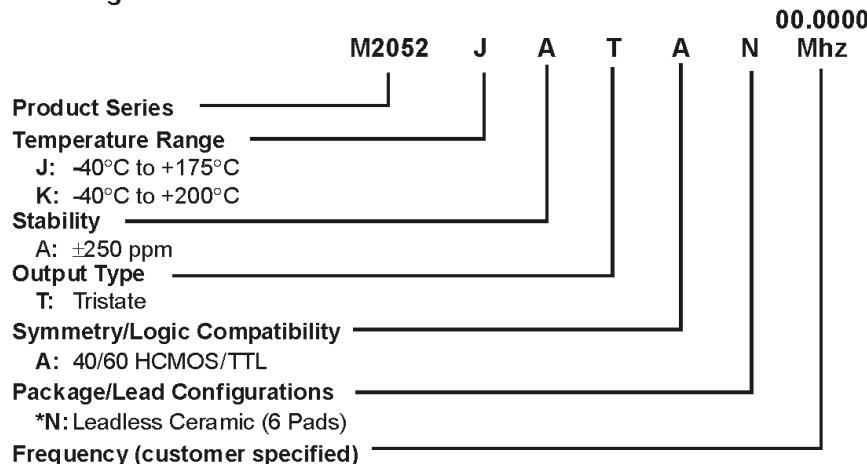
M2052 Series

5 x 7 mm, 3.0, 3.3 & 3.6 Volt, HCMOS/TTL
High Operating Temperature SMT Oscillator



- Extreme operating temperature range to 200°C
- Designed for harsh shock and vibration applications
- Hermetically sealed
- Long term reliability
- Small form factor 5x7 SMT
- 5x7 lead and DIP package option coming soon (contact factory for availability)

Ordering Information



*Contact factory for other package options

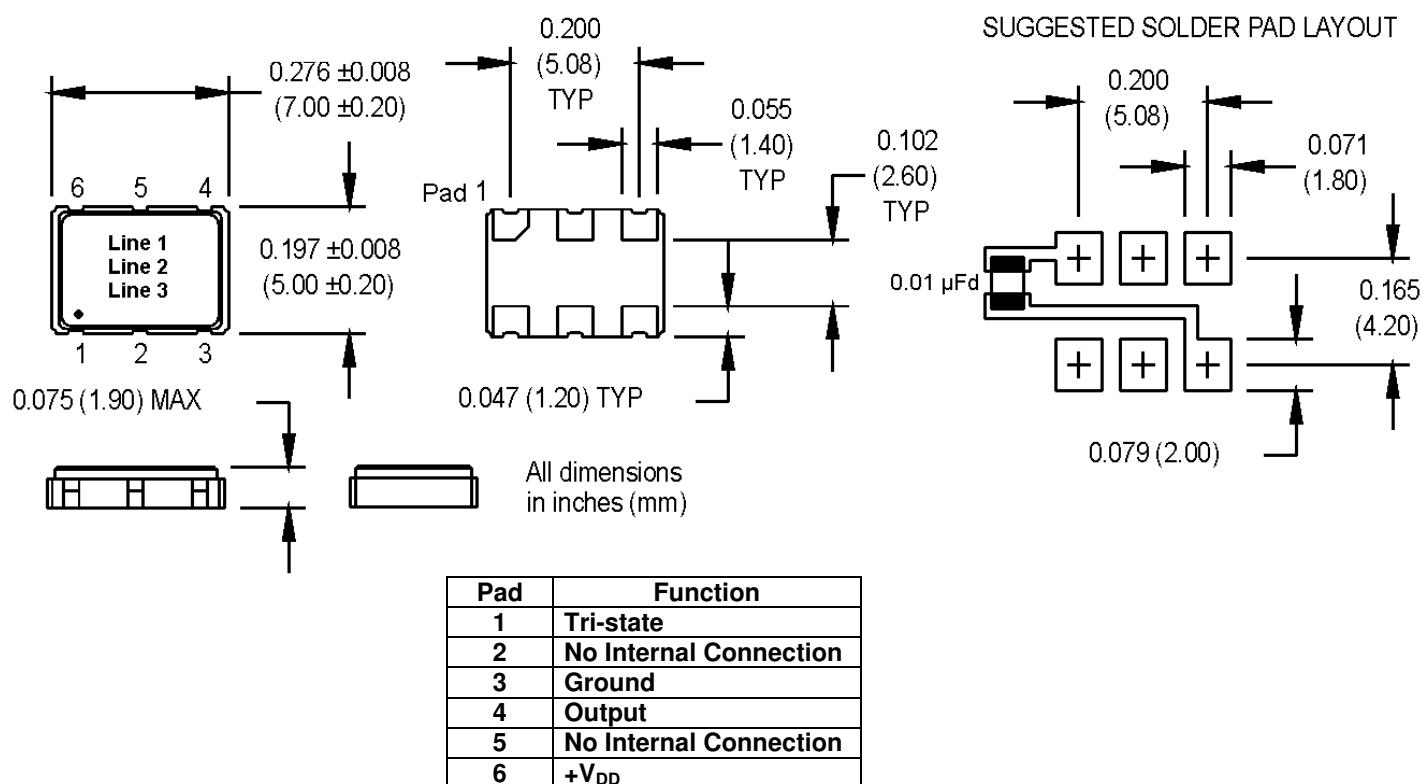
Applications:

- Down Hole Drilling Tools for Oil and Gas Exploration
- Extreme Thermal Applications
- Geo-Thermal Exploration

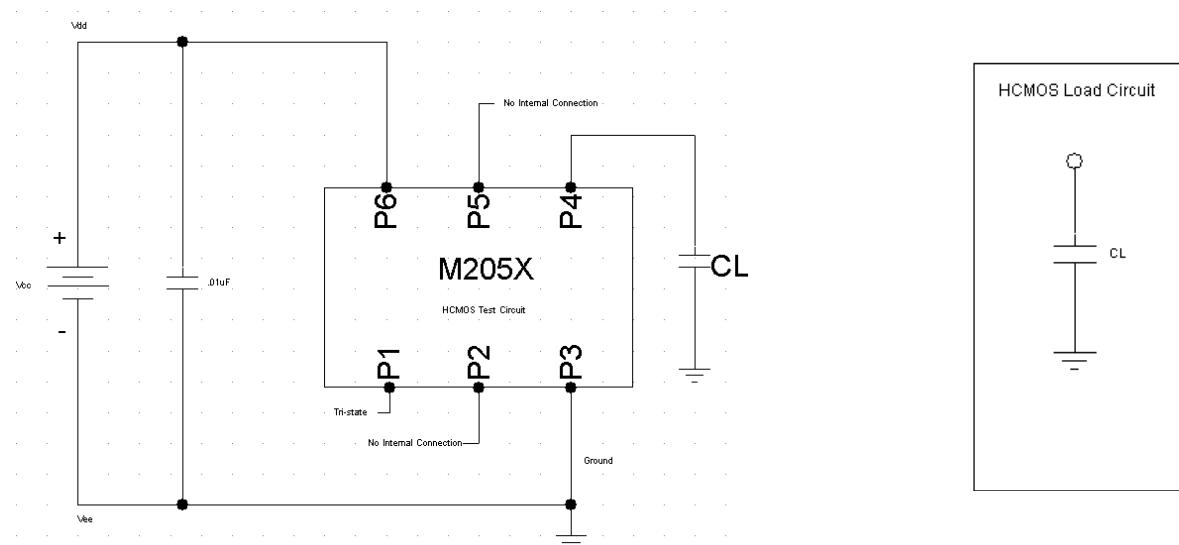
	Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Electrical Specifications	Frequency Range	F_o	10.000000		35.000000	MHz	
	Frequency Stability	$\Delta F/F$	-250		+250	ppm	Includes initial calibration tolerance and deviation over operating temperature.
	Operating Temperature	T_A	-40		+200	°C	
	Storage Temperature	T_S	-55		+200	°C	
	Operating Voltage	V_{DD}	3.0	3.3	3.6	V	
	Operating Current	I_{DD}	1.5		mA	@ 10 MHz	
			3.0		mA	@ 25 MHz	
			4.0		mA	@ 35 MHz	
	Output Type		HCMOS/TTL Compatible				
	Output Load			15/2		pF/TTL	
	Symmetry (duty cycle)	T_{DC}	40		60	%	Ref to $\frac{1}{2} V_{DD}$
	Logic "1" Level	V_{OH}	90% V_{DD}			V	HCMOS load
	Logic "0" Level	V_{OL}		10% V_{DD}		V	HCMOS load
Environmental	Rise/Fall Time	T_R/T_F		4		ns	From 10% to 90% V_{DD} . Frequency dependent.
	Random Jitter		5	12	ps		RMS (1-Sigma)
	Tri-State Function		Logic "1", or floating, Enables Output Logic "0" Disables Output to a High-Z				Pad 1
	Mechanical Shock		Per MIL-STD-202, Method 213, Condition E (1000 g's, 0.5 ms duration, $\frac{1}{2}$ sinewave)				
	Vibration		Per MIL-STD-202, Method 204, Condition D (10-2000 Hz at 20 g's)				
	Hermeticity		Per MIL-STD-202, Method 112 (1×10^{-8} atm cc/s of Helium)				
	Solderability		Per EIAJ-STD-002				
	Max. Soldering Conditions		See solder profile				
	Package Type		5 X 7 X 1.9 mm leadless ceramic. RoHS compliant.				

MtronPTI reserves the right to make changes to the product(s) and service(s) described herein without notice. No liability is assumed as a result of their use or application. Please see www.mtronpti.com for our complete offering and detailed datasheets. Contact us for your application specific requirements: MtronPTI 1-800-762-8800.

M2052 Series
5 x 7 mm, 3.0, 3.3 & 3.6 Volt, HCMOS/TTL
High Operating Temperature SMT Oscillator



Test Circuit Diagram



MtronPTI reserves the right to make changes to the product(s) and service(s) described herein without notice. No liability is assumed as a result of their use or application. Please see www.mtronpti.com for our complete offering and detailed datasheets. Contact us for your application specific requirements: MtronPTI 1-800-762-8800.

M210x Series

5x7 mm, 3.3/2.5/1.8 Volt, LVPECL/LVDS/CML,
Clock Oscillator



QiK Chip™



- Featuring **QiK Chip™** Technology
- From order to ship in 2 weeks
- Superior Jitter Performance (less than 0.25 ps RMS, 12 kHz - 20 MHz)
- SAW replacement - better performance
- Frequencies from 50 MHz to 1.4 GHz

Applications:

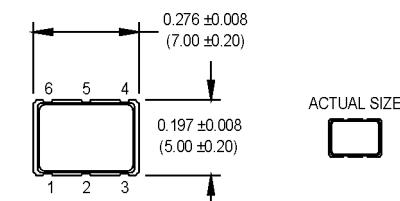
- Telecommunications such as SONET / SDH / DWDM / FEC / SERDES / OC-3 thru OC-192
- 1-2-4-10 Gigabit Fibre Channel
- Wireless Base Stations / WLAN / Gigabit Ethernet
- Avionic Flight Controls
- Military Communications
- Clock and Data Recovery
- SD/HD Video
- FPGA/ASIC Clock Generation
- Test and Measurement Equipment

Ordering Information

M210	0	6	8	B	P	C	00.0000
Product Series							MHz
Supply Voltage	0: 3.3 V	1: 2.5 V					
	2: 1.8 V						
Temperature Range	2: -40°C to +85°C						
	6: -20°C to +70°C						
Stability	4: ±50 ppm	3: 100 ppm					
	8: ±20 ppm						
Enable/Disable	B: Enable High (pin 1)	G: Enable High (pin 2)					
	S: Enable Low (pin 1)	M: Enable Low (pin 2)					
	U: No Enable/Disable						
Logic Type	P: LVPECL	L: LVDS					
	M: CML						
Package/Lead Configuration	C: 5x7 mm Leadless (6 Pin)						
	N: 5x7 mm Leadless (9 Pin - Contact Factory for availability)						
Frequency (customer specified)							

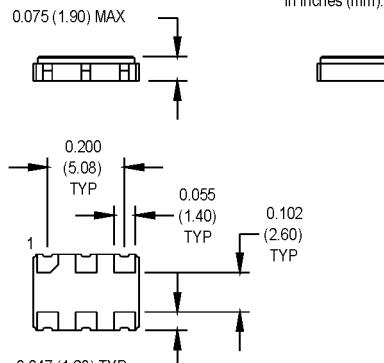
6 Pad Standard Option

Contact factory for 9-Pad Option

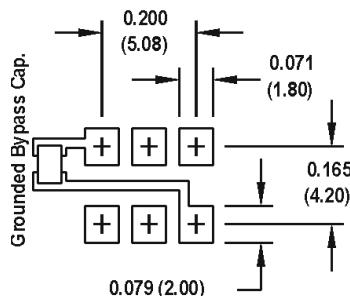


ACTUAL SIZE

All dimensions
in inches (mm).



SUGGESTED SOLDER PAD LAYOUT



M210x Series
5x7 mm, 3.3/2.5/1.8 Volt, LVPECL/LVDS/CML,
Clock Oscillator

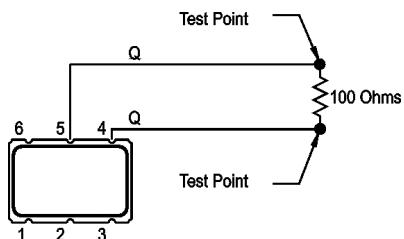


PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition/Notes
Frequency Range	F	50		1400	MHz	See Note 1
Operating Temperature	T _A			(See ordering information)		
Storage Temperature	T _S	-55		+125	°C	
Frequency Stability	ΔF/F			(See ordering information)		See Note 2
Aging 1st Year Thereafter (per year)		-3 -1		+3 +1	ppm ppm	
Supply Voltage	V _{CC}	1.71 2.375 3.135	1.8 2.5 3.3	1.89 2.625 3.465	V V V	LVDS/CML
Input Current	I _{CC}			125	mA	LVPECL/LVDS/CML
Load			50 Ohms to (V _{CC} - 2) Vdc 100 Ohm differential load			See Note 3 LVPECL Waveform LVDS/CML Waveform
Symmetry (Duty Cycle)		45		55	%	LVPECL – V _{DD} -1.3 V LVDS – 1.25 V
Output Skew			20 15 20		ps ps ps	LVPECL CML LVDS
Differential Voltage	V _{OD}	250	350	450	mV	LVDS
	V _{OD}	0.7	.095	1.20	V _{PP}	CML
Common Mode Output Voltage	V _{CM}		1.2		V	LVDS
Logic "1" Level	V _{OH}	V _{CC} - 1.02			V	LVPECL
Logic "0" Level	V _{OL}			V _{CC} - 1.63	V	LVPECL
Rise/Fall Time	T _R /T _F		0.23	0.50	ns	@ 20/80% LVPECL, LVDS, CML
Enable Function			80% V _{CC} min or N/C: Output active 0.5V max: Output disables to high-Z			Output Option B or G
			0.5V max or N/C: Output active 80% V _{CC} min: Output disables to high-Z			Output Option S or M
Start up Time				10	ms	
Phase Jitter @ 622.08 MHz	φJ		0.25		ps RMS	Integrated 12 kHz – 20 MHz
Phase Noise						@ 622.08 MHz
10 Hz			-60			dBc/Hz
100 Hz			-97			dBc/Hz
1 KHz			-107			dBc/Hz
10 KHz			-116			dBc/Hz
100 KHz			-121			dBc/Hz
1 MHz			-134			dBc/Hz
10 MHz			-146			dBc/Hz
100 MHz			-148			dBc/Hz
Environmental	Mechanical Shock		Per MIL-STD-202, Method 213, Condition C (100 g's, 6 mS duration, 1/2 sinewave)			
	Vibration		Per MIL-STD-202, Method 201 & 204 (10 g's from 10-2000 Hz)			
	Hermeticity		Per MIL-STD-202, Method 112, (1x10 ⁻⁸ atm. cc/s of Helium)			
	Thermal Cycle		Per MIL-STD-883, Method 1010, Condition B (-55°C to +125°C, 15 min. dwell, 10 cycles)			
	Solderability		Per EIAJ-STD-002			
	Max Soldering Conditions		See solder profile, Figure 1			

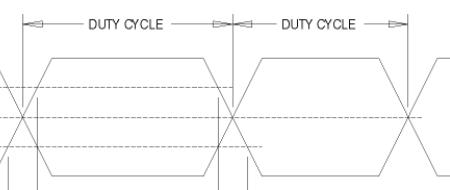
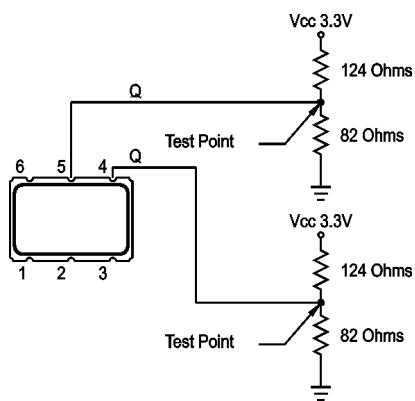
Note 1: Contact factory for standard frequency availability over 945 MHz

Note 2: Stability is inclusive of initial tolerance, deviation over temperature, shock, vibration, supply voltage, and aging for one year at 50°C mean ambient temperature.

Note 3: See Load Circuit Diagram in this Datasheet. Consult factory with nonstandard output load requirements.



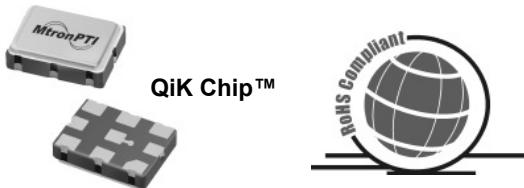
LVDS Load Circuit



Output Waveform: LVDS/CML/PECL

M21x Series Multiple Frequency Clock Oscillator

5x7 mm, 3.3/2.5/1.8 Volt, LVPECL/LVDS/CML/HCMOS Output



- Multiple Output Frequencies (2, 3, or 4) - Selectable
- QiK Chip™** Technology
- Superior Jitter Performance (less than 0.25 ps RMS, 12 kHz - 20 MHz)
- SAW replacement - better performance
- Frequencies from 50 MHz - 1.4 GHz (LVDS/LVPECL/CML)
- Frequencies from 10 MHz - 150 MHz (HCMOS)

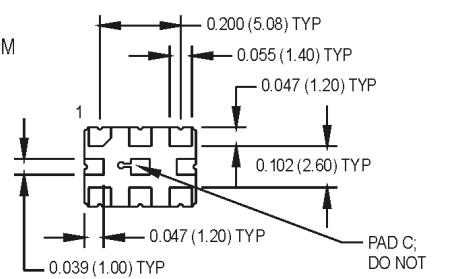
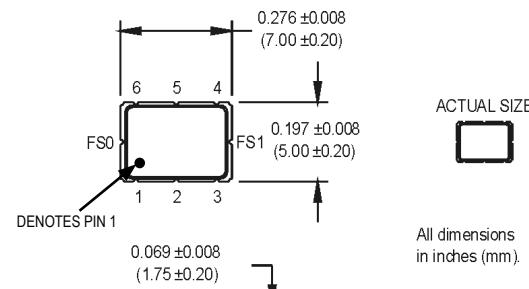
Phase Lock Loop Applications:

- Global/Regional selection
- Forward Error Correction (FEC) / Selectable Functionality applications
- Telecommunications such as SONET / SDH / DWDM / FEC / SERDES / OC-3 thru OC-192
- 1-2-4-10 Gigabit Fibre Channel
- Wireless base stations / WLAN / Gigabit Ethernet
- xDSL, Network Communications
- Avionic flight controls
- Military communications
- Clock and data recovery
- Low jitter clock generation
- Frequency margining

Ordering Information	
M21	X
Product Series	X
Number of Frequencies	X
2: Two Selectable Frequencies	X
3: Three Selectable Frequencies	X
4: Four Selectable Frequencies	X
Supply Voltage	X
0: 3.3 V	X
1: 2.5 V	X
2: 1.8 V	X
Operating Temperature	X
2: -40°C to +85°C	X
6: -20°C to +70°C	X
Stability	X
4: ±50 ppm	X
3: ±100 ppm	X
8: ±20 ppm	X
Enable/Disable Function	X
B: Enable High (Pad 2)	G: Enable High (Pad 2)
S: Enable Low (Pad 1)	M: Enable Low (Pad 2)
Two Frequency Select Function	X
1: FS0=Pad 1	X
2: FS0=Pad 2	X
*A: FS0=Pad A	X
Logic Type	X
P: LVPECL	L: LVDS
M: CML	C: HCMOS
Package/Lead Configuration	X
N: 5x7 mm Leadless	X
Factory Assigned to Accommodate	X
Customer Specified Frequencies - Contact Factory	X

*For three and four frequency selections, FS0=Pad A

M2120Sxxx, M2121Sxxx, M2122Sxxx, M2130Sxxx, M2131Sxxx, M2132Sxxx, M2140Sxxx, M2141Sxxx, M2142Sxxx - Contact factory for datasheets.



Frequency Select Truth Table		
	FS1	FS0
Frequency 1	High	High
Frequency 2	High	Low
Frequency 3	Low	High
Frequency 4	Low	Low

NOTE: Logic Low = 20% Vcc max.
Logic High = 80% Vcc min.

PAD 1 ENABLE

Pad1: Enable/Disable or Tristate

Pad2: N/C or FS0

Pad3: Ground

Pad4: Output Q (LVPECL,LVDS,CML,HCMOS)

Pad5: Output \bar{Q} (LVPECL,LVDS,CML) N/C for HCM

Pad6: Vcc

PadA: FS0 or N/C

PadB: FS1

PadC: Do not connect!

PAD 2 ENABLE

Pad1: N/C or FS0

Pad2: Enable/Disable or Tristate

Pad3: Ground

Pad4: Output Q (LVPECL,LVDS,CML,HCMOS)

Pad5: Output \bar{Q} (LVPECL,LVDS,CML) N/C for HCM

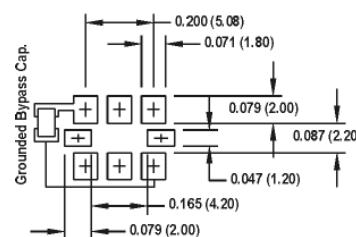
Pad6: Vcc

PadA: FS0 or N/C

PadB: FS1

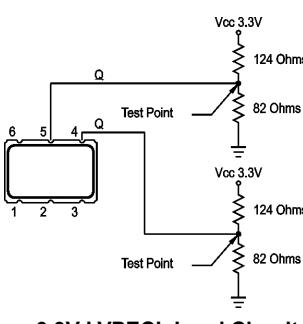
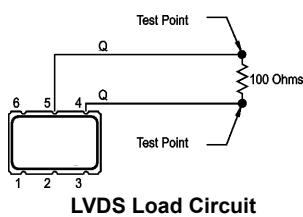
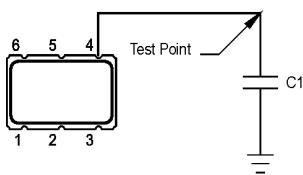
PadC: Do not connect!

SUGGESTED SOLDER PAD LAYOUT



M21x Series Multiple Frequency Clock Oscillator

5x7 mm, 3.3/2.5/1.8 Volt, LVPECL/LVDS/CML/HCMOS Output

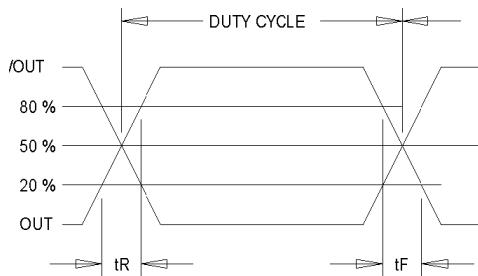


PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition/Notes
Frequency Range	F	50 10		1400 150	MHz	LVPECL/LVDS/CML - See Note 1 HCMOS
Operating Temperature	TA		-20 to +70 -40 to +85		°C	Customer Specified
Storage Temperature	Ts	-55		+125	°C	
Frequency Stability	ΔF/F		See Ordering Information		ppm	See Note 2
Aging						
1st Year		-3		+3	ppm	
Thereafter (per year)		-1		+1	ppm	
Supply Voltage	Vcc	1.71 2.375 3.135	1.8 2.5 3.3	1.89 2.625 3.465	V	
Input Current	Icc			125 105	mA	LVPECL/HCMOS/CML LVDS
Load				15	pF	See Note 3 LVPECL Waveform LVDS/CML Waveform CMOS Waveform
Symmetry (Duty Cycle)		45		55	%	LDPECL: Vdd - 1.3 V LVDS: 1.25 V
Output Skew			20 15 20		ps	LVPECL CML LVDS
Differential Voltage	Vod	250	350	450	mV	LVDS
	Vod	0.7	0.95	1.20	Vpp	CML
Common Mode Output Voltage	Vcm		1.2		V	LVDS
Logic "1" Level	Voh	Vcc -1.02			V	LVPECL
		90% Vdd				HCMOS
Logic "0" Level	Vol			Vcc -1.63	V	LVPECL
				10% Vdd		HCMOS
Rise/Fall Time	Tr/Tf		0.23	0.35	ns	@ 20/80% LVPECL, LVDS, CML
				6.0	ns	Ref. 10%-90% Vdd HCMOS
Enable Function		80% Vcc min. or N/C: Output active 0.5V max: Output disables to high-Z				Customer Specified
Option B						
Enable Function		0.5V max or N/C: Output active 80% Vcc min: Output disables to high-Z				Customer Specified
Option S						
Tristate Function		Input Logic "1" or floating: output active Input Logic "0": output disables to high-Z				Customer Specified
Frequency Selection		See Truth Table				
Settling Time				10	ms	To within ± 1 ppm of frequency
Start up Time				10	ms	
Phase Jitter						
@ 622.08 MHz	φJ		0.25		ps RMS	LVPECL/LVDS/CML Integrated 12 kHz - 20 MHz
@ 125 MHz				0.50	ps RMS	HCMOS (12 kHz - 20 MHz)
Environmental						
Mechanical Shock		Per MIL-STD-202, Method 213, Condition C (100 g's, 6 mS duration, $\frac{1}{2}$ sinewave)				
Vibration		Per MIL-STD-202, Method 201 & 204 (10 g's from 10-2000 Hz)				
Hermeticity		Per MIL-STD-202, Method 112, (1×10^{-8} atm. cc/s of Helium)				
Thermal Cycle		Per MIL-STD-883, Method 1010, Condition B (-55°C to +125°C, 15 min. dwell, 10 cycles)				
Solderability		Per EIAJ-STD-002				
Max. Soldering Cond.		See solder profile, Figure 1				

Note 1: Contact factory for standard frequency availability over 945 MHz.

Note 2: Stability is inclusive of initial tolerance, deviation over temperature, shock, vibration, supply voltage, and aging for one year at 50°C mean ambient temperature.

Note 3: See Load Circuit Diagram in this datasheet. Consult factory with nonstandard output load requirements.



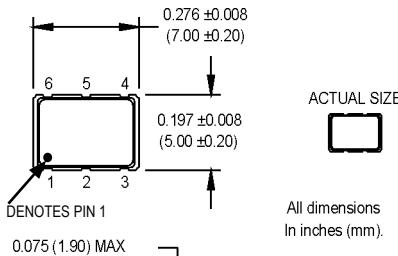
Output Waveform: LVDS/CML/LVPECL

UVCJ Series

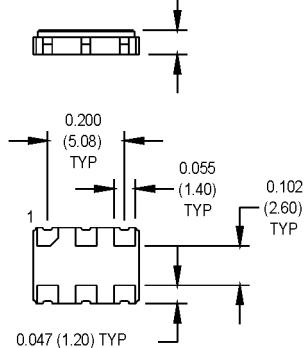
5x7 mm, 3.3 Volt, LVPECL/LVDS, Clock Oscillators



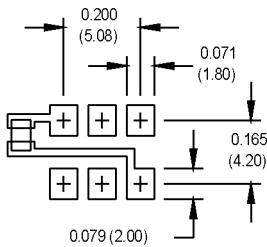
- Integrated phase jitter of less than 1 ps from 12 kHz to 20 MHz
- Ideal for 10 and 40 Gigabit Ethernet and Optical Carrier applications



All dimensions
in inches (mm).



SUGGESTED SOLDER PAD LAYOUT



PIN 1 ENABLE

Pad1: Enable/Disable

Pad2: N/C

Pad3: Ground

Pad4: Output Q (LVPECL,LVDS,CML)

Pad5: Output \bar{Q} (LVPECL,LVDS,CML)

Pad6: Vcc

PIN 2 ENABLE

Pad1: N/C

Pad2: Enable/Disable

Pad3: Ground

Pad4: Output Q (LVPECL,LVDS,CML)

Pad5: Output \bar{Q} (LVPECL,LVDS,CML)

Pad6: Vcc

Ordering Information

Product Series	UVCJ	1	8	B	L	N	00.0000 MHz
Temperature Range							
1: 0°C to +70°C	2: -40°C to +85°C						
6: -20°C to +70°C	7: -0°C to +85°C						
8: 0°C to +50°C							
Stability							
3: ±100 ppm	4: ±50 ppm						
6: ±25 ppm	8: ±20 ppm						
Enable/Disable							
B: Enable High (pin 1)	G: Enable High (pin 2)						
S: Enable Low (pin 1)	M: Enable Low (pin 2)						
U: No Enable/Disable							
Symmetry/Output Logic Type							
L: 45/55% LVDS	P: 45/55% PECL						
H: 40/60% LVDS	Q: 40/60% PECL						
Package/Lead Configurations							
N: Leadless Ceramic (6 pads)							
Frequency (customer specified)							

M2013Sxxx - Contact factory for datasheet.

Electrical Specifications						
PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition/Notes
Frequency Range	F	0.75		700	MHz	
Operating Temperature	T _A	(See ordering information)				
Storage Temperature	T _S	-55		+125	°C	
Frequency Stability	ΔF/F	(See ordering information)				
Aging						
1st Year		-3/-5		+3/+5	ppm	<52 MHz/≥52 MHz
Thereafter (per year)		-1/-2		+1/-2	ppm	<52 MHz/≥52 MHz
Input Voltage	V _{CC}	3.135	3.3	3.465	V	
Input Current	I _{CC}					
0.75 to 24 MHz				70/30	mA	PECL/LVDS
24 to 700 MHz				100/60	mA	PECL/LVDS
Output Type						PECL/LVDS
Load		50 Ohms to V _{CC} - 2 VCD 100 Ohm differential load				
Symmetry (Duty Cycle)		(See ordering information)				
Output Skew				200	ps	PECL
Differential Voltage	V _{OD}	250	350	450	mV	LVDS
Logic "1" Level	V _{OH}	V _{CC} - 1.02			V	LVPECL
Logic "0" Level	V _{OL}			V _{CC} - 1.63	V	LVPECL
Rise/Fall Time	T _{RI/TF}		0.35	0.55	ns	@ 20/80% LVPECL
			0.50	1.0	ns	@ 20/80% LVDS
Enable Function		80% V _{CC} min or N/C output active 20% V _{CC} max: output disables to high-Z				
		PECL low, GND, or N/C – output active PECL high 0 output disables to high-Z				
Start up Time				10	ms	
Phase Jitter (Typical)	φJ					See Note 3
0.75 to 49.00 MHz			2.25		ps RMS	Integrated 12 kHz – 20 MHz
50.00 to 161.00 MHz			0.35		ps RMS	Integrated 12 kHz – 20 MHz
162.00 to 239.00 MHz			2.85		ps RMS	Integrated 12 kHz – 20 MHz
240.00 to 499.00 MHz			1.95		ps RMS	Integrated 12 kHz – 20 MHz
500.00 to 700.00 MHz			1.30		ps RMS	Integrated 12 kHz – 20 MHz
Environmental						
Mechanical Shock		MIL-STD-202, Method 213, C (100 g's)				
Vibration		MIL-STD-202, Method 201 & 204 (10 g's from 10-2000 Hz)				
Thermal Cycle		MIL-STD-883, Method 1010, B (-55°C to +125°C, 15 min dwell, 10 cycles)				
Hermeticity		MIL-STD-202, Method 112				
Solderability		Per EIAJ-STD-002				
Max Soldering Conditions		See solder profile, Figure 1				

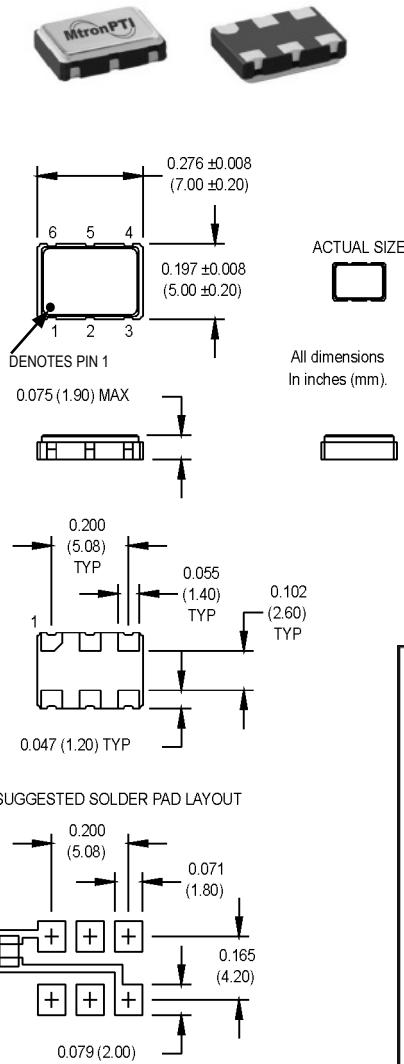
1. Inclusive of initial tolerance, deviation over temperature, shock, vibration, voltage and aging.

2. PECL load - see Load Circuit Diagram #5. LVDS load – see load circuit diagram #9. Consult factory with nonstandard output load requirements.

3. Consult factory for phase jitter at other specific frequencies.

UVC Series

5x7 mm, 3.3 Volt, LVPECL/LVDS, Clock Oscillators



Ordering Information

Product Series	UVC	1	8	R	L	N	00.0000 MHz
Temperature Range	1: 0°C to +70°C 6: -20°C to +70°C 8: 0°C to +50°C	2: -40°C to +85°C 7: -0°C to +85°C					
Stability	3: ±100 ppm 6: ±25 ppm	4: ±50 ppm 8: ±20 ppm					
Output Type	R: Complementary Enable Z: Complementary w/o Enable						
Symmetry/Output Logic Type	L: 45/55% LVDS H: 40/60% LVDS	P: 45/55% PECL Q: 40/60% PECL					
Package/Lead Configurations	N: Leadless Ceramic (6 pads)						
Frequency (customer specified)							

M2022Sxxx - Contact factory for datasheet.

Electrical Specifications						
PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition/Notes
Frequency Range	F	0.75		800	MHz	
Operating Temperature	T _A			(See ordering information)		
Storage Temperature	T _S	-55		+125	°C	
Frequency Stability	ΔF/F			(See ordering information)		See Note 1
Aging						
1st Year		-3		+3	ppm	
Thereafter (per year)		-1		+1	ppm	
Input Voltage	V _{CC}	3.135	3.3	3.465	V	
PECL Input Current	I _{CC}			70 100 110	mA	0.75 to 24 MHz 24 to 96 MHz 96 to 800 MHz
LVDS Input Current	I _{CC}			30 60 60	mA	0.75 to 24 MHz 24 to 96 MHz 96 to 800 MHz
Output Type						PECL/LVDS
Load				50 Ohms to V _{CC} - 2 VCD 100 Ohm differential load		See Note 2 PECL Waveform LVDS Waveform
Symmetry (Duty Cycle)				(See ordering information)		@ 50% of waveform
Output Skew				200	ps	PECL
Differential Voltage	V _{OD}	250	350	450	mV	LVDS
Logic "1" Level	V _{OH}	V _{CC} - 1.02			V	PECL
Logic "0" Level	V _{OL}			V _{CC} - 1.63	V	PECL
Rise/Fall Time	T _{RI} /T _{FF}		0.35 0.50	0.55 1.0	ns	@ 20/80% LVPECL @ 20/80% LVDS
Enable Function			80% V _{CC} min or N/C: output active 20% V _{CC} max: output disables to high-Z			Output Option R
Start up Time				10	ms	
Phase Jitter (Typical)	φJ		3	5	ps RMS	Integrated 12 kHz - 20 MHz
Environmental						
Mechanical Shock		MIL-STD-202, Method 213, C (100 g's)				
Vibration		MIL-STD-202, Method 201 & 204 (10 g's from 10-2000 Hz)				
Thermal Cycle		MIL-STD-883, Method 1010, B (-55°C to +125°C, 15 min dwell, 10 cycles)				
Hermeticity		MIL-STD-202, Method 112				
Solderability		Per EIAJ-STD-002				
Max Soldering Conditions		See solder profile, Figure 1				

1. Inclusive of initial tolerance, deviation over temperature, shock, vibration, voltage and aging.

2. PECL load - see Load Circuit Diagram #5. LVDS load - see load circuit diagram #9.

M220x Series

9x14 mm, 3.3/2.5/1.8 Volt, LVPECL/LVDS/CML, Clock Oscillator



QiK Chip™



- Featuring **QiK Chip™** Technology
- From order to ship in 2 weeks
- Superior Jitter Performance (less than 0.25 ps RMS, 12 kHz - 20 MHz)
- SAW replacement - better performance
- Frequencies from 150 MHz to 1.4 GHz

Applications:

- Telecommunications such as SONET / SDH / DWDM / FEC / SERDES / OC-3 thru OC-192
- 1-2-4-10 Gigabit Fibre Channel
- Wireless Base Stations / WLAN / Gigabit Ethernet
- Avionic Flight Controls
- Military Communications
- Clock and Data Recovery
- SD/HD Video
- FPGA/ASIC Clock Generation
- Test and Measurement Equipment

Ordering Information

M220	0	6	8	B	P	J	00.0000
Product Series							
Supply Voltage	0: 3.3 V	1: 2.5 V					
	2: 1.8 V						
Temperature Range	2: -40°C to +85°C	6: -20°C to +70°C					
Stability	4: ±50 ppm	3: ±100 ppm					
	8: ±20 ppm						
Enable/Disable	B: Enable High (pin 1)	G: Enable High (pin 2)					
	S: Enable Low (pin 1)	M: Enable Low (pin 2)					
	U: No Enable/Disable						
Logic Type	P: LVPECL	L: LVDS					
	M: CML						
Package/Lead Configuration	J: 9x14 mm J-lead						
Frequency (customer specified)							

M2200Sxxx, M2201Sxxx, M2202Sxxx - Contact factory for datasheets.

PIN 1 ENABLE

Pin1: Enable/Disable

Pin2: N/C

Pin3: Ground

Pin4: Output Q (LVPECL,LVDS,CML)

Pin5: Output \bar{Q} (LVPECL,LVDS,CML)

Pin6: Vcc

PIN 2 ENABLE

Pin1: N/C

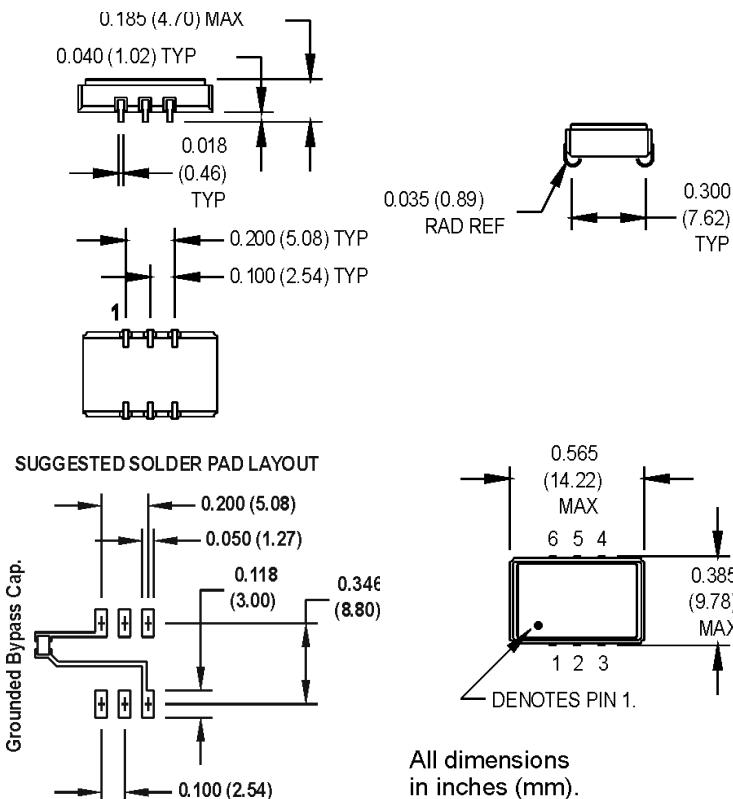
Pin2: Enable/Disable

Pin3: Ground

Pin4: Output Q (LVPECL,LVDS,CML)

Pin5: Output \bar{Q} (LVPECL,LVDS,CML)

Pin6: Vcc

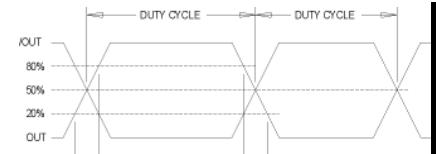
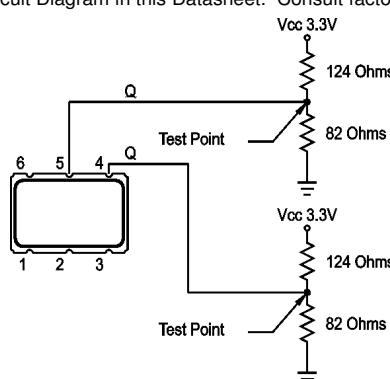
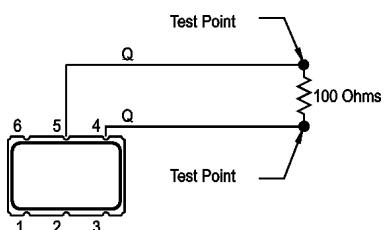


PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition/Notes
Frequency Range	F	50		1400	MHz	See Note 1
Operating Temperature	TA	(See ordering information)				
Storage Temperature	Ts	-55		+125	°C	
Frequency Stability	ΔF/F	(See ordering information)				See Note 2
Aging 1st Year Thereafter (per year)		-3 -1		+3 +1	ppm ppm	
Supply Voltage	Vcc	1.71 2.375 3.135	1.8 2.5 3.3	1.89 2.625 3.465	V V V	LVDS/CML
Input Current	Icc			125	mA	LVPECL/LVDS/CML
Load		50 Ohms to (Vcc - 2) Vdc 100 Ohm differential load				See Note 3 LVPECL Waveform LVDS/CML Waveform
Symmetry (Duty Cycle)		45		55	%	LVPECL – Vdd-1.3 V LVDS – 1.25 V
Output Skew			20 15 20		ps ps ps	LVPECL CML LVDS
Differential Voltage	Vod	250	350	450	mV	LVDS
	Vod	0.7	.095	1.20	Vpp	CML
Common Mode Output Voltage	Vcm		1.2		V	LVDS
Logic "1" Level	Voh	Vcc -1.02			V	LVPECL
Logic "0" Level	Vol			Vcc -1.63	V	LVPECL
Rise/Fall Time	Tr/Tf		0.23	0.50	ns	@ 20/80% LVPECL, LVDS, CML
Enable Function		80% Vcc min or N/C: Output active 0.5V max: Output disables to high-Z				Output Option B or G
		0.5V max or N/C: Output active 80% Vcc min: Output disables to high-Z				Output Option S or M
Start up Time				10	ms	
Phase Jitter @ 622.08 MHz	φJ		0.25		ps RMS	Integrated 12 kHz – 20 MHz
Phase Noise						
10 Hz				-60		@ 622.08 MHz
100 Hz				-97		dBc/Hz
1 KHz				-107		dBc/Hz
10 KHz				-116		dBc/Hz
100 KHz				-121		dBc/Hz
1 MHz				-134		dBc/Hz
10 MHz				-146		dBc/Hz
100 MHz				-148		dBc/Hz
Mechanical Shock		Per MIL-STD-202, Method 213, Condition C (100 g's, 6 mS duration, 1/2 sinewave)				
Vibration		Per MIL-STD-202, Method 201 & 204 (10 g's from 10-2000 Hz)				
Hermeticity		Per MIL-STD-202, Method 112, (1x10 ⁻⁸ atm. cc/s of Helium)				
Thermal Cycle		Per MIL-STD-883, Method 1010, Condition B (-55°C to +125°C, 15 min. dwell, 10 cycles)				
Solderability		Per EIAJ-STD-002				
Max Soldering Conditions		See solder profile, Figure 1				

Note 1: Contact factory for standard frequency availability over 945 MHz

Note 2: Stability is inclusive of initial tolerance, deviation over temperature, shock, vibration, supply voltage, and aging for one year at 50°C mean ambient temperature.

Note 3: See Load Circuit Diagram in this Datasheet. Consult factory with nonstandard output load requirements.

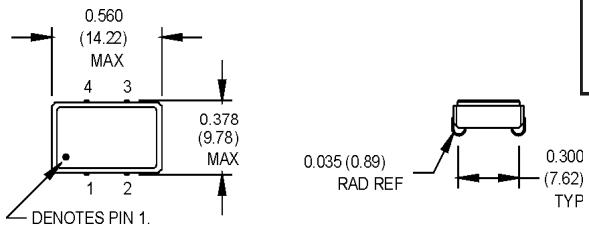


Output Waveform: LVDS/CML/PECL

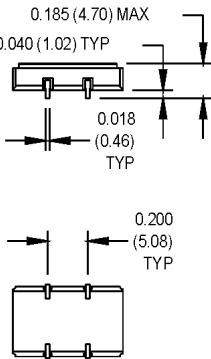
MIL-PRF-55310 QPL Oscillators

Oscillators qualified under MIL-PRF-55310

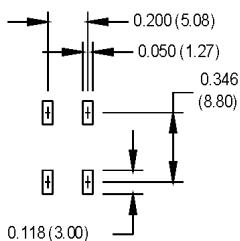
Oscillator designs requiring military approval fall into two categories, those which have been subjected to formal QPL qualification under MIL-PRF-55310 and others too new and/or too limited in quantity to have been so certified or are built to customers' SCD (Source Controlled Document). MtronPTI does both in a MIL-STD-790 certified facility.



All dimensions in inches (mm).



SUGGESTED SOLDER PAD LAYOUT



PIN	FUNCTION
1	Tristate
2	Ground
3	Output
4	Vdd

Ordering Information

M55310/30-		M	11	A	T	00.0000
Product Series						
Military Designation						
Product Level						
B: Military						
C: Commercial						
Electrical Specs						
11: See table below						
14: See table below						
Stability Option/Temp Range						
A: See table below						
B: See table below						
C: See table below						
Leads						
T: Tin solder (standard)						
*Blank: Customer specified						
Frequency (customer specified)						

*Contact factory for other non-QPL lead finishes

*

Dash Numbers and Operating Characteristics					
Dash Number	Output Frequency Range	Initial Accuracy at +23°C ±1°C	Frequency-Temperature Stability (ppm) 1/		
			-55°C to +125°C	-55°C to +105°C	-20°C to +70°C
			A	B	C
11	15.000 MHz to 29.999 MHz	±15 ppm	±50 ppm	±40 ppm	±25 ppm
14	15.000 MHz to 29.999 MHz	±25 ppm	±100 ppm	±80 ppm	±50 ppm

1/ Temperature range A applicable for product level B oscillators only.

QPL PRODUCT LEVEL B 100% SCREENING	
Test Inspection	Method or Condition
Internal Visual	MIL-STD-883, method 2017 and 2032
Stabilization bake (prior to seal)	MIL-STD-883, method 1008, condition C (+150°C), 24 hours minimum
Temperature cycling	MIL-STD-883, method 1010, condition B
Constant acceleration	MIL-STD-883, method 2001, condition A, Y1 only (5000 g's)
Seal (fine and gross Leak)	MIL-STD-883, method 1014
Electrical test	ATE (ambient)
Burn-in (load)	+125°C, nominal supply voltage and burn-in load, 160 hours minimum
Electrical test	Nominal supply voltage, specified load, +23°C and verify frequency at the temperature extremes.

MIL-PRF-55310 QPL Oscillators

For reference only. See MIL-PRF-55310/30 for current actual requirements.

	PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition/Notes	
Electrical Specifications	Frequency Range	F	15		29.999	MHz		
	Storage Temperature	T _S	-62		+125	°C		
	Aging							
	Per Year				±1.5	±10	ppm	
	Per 30 Days				±3		ppm	
	Per 90 Days						ppm	
	Supply Voltage			+3.3 V dc	±10 percent			
	Input Current	I _{dd}			10	mA	See note 1	
	Frequency vs. Voltage Stability			±4 ppm maximum for a ±10 % change in supply voltage				
	Duty Cycle			45		55	%	See figure 2
Logic "1" Level	V _{oh}	90% V _{dd}				V	See figure 2	
Logic "0" Level	V _{ol}			10% V _{dd}		V		
Rise/Fall Time	T _r /T _f			10	ns	See figure 2		
Start up Time				10	ms			
Environmental	Ambient Pressure		Nonoperating – MIL-PRF-55310, Operating – Method 105 of MIL-STD-202, test condition C, exposure time 5 minutes					
	Terminal Strength		Method 211 of MIL-STD-202, test condition A, 8 ounces of force each terminal					
	Mechanical Shock		MIL-STD-202, Method 213, C (100 g's)					
	Vibration		MIL-STD-202, Method 201 & 204 (10 g's from 10-2000 Hz)					
	Thermal Cycle		MIL-STD-883, Method 1010, B (-55°C to +125°C, 15 min dwell, 10 cycles)					
	Hermeticity		MIL-STD-202, Method 112					
	Solderability		Per EIAJ-STD-002					
	Reflow Soldering		+230°C ±10°C for 15 seconds					

1. Maximum input current for no load condition.

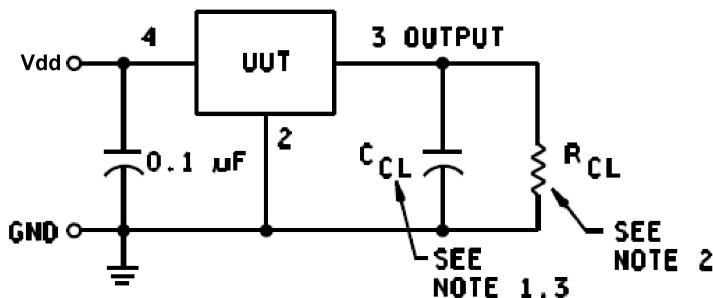


Figure 1: Test Circuit

1. For $C_{CL} = 15\text{pF} \pm 5\text{ percent}$
2. For $R_{CL} = 10\text{k}\Omega \pm 5\text{ percent}$
3. C_{CL} includes scope capacitance

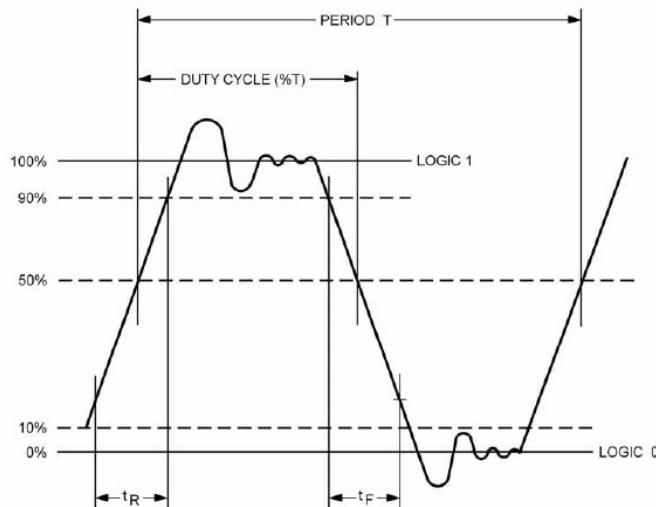


Figure 2: Output Waveform

Crystal/Resonator Selection Guide

Package Size	Frequency Range	Operating Temperature	Family	Page Number
HC-49/S	3.58 - 72 MHz	-10°C to +70°C	ATSM-49	
HC-49U/S	3.58 - 72 MHz	-10°C to +70°C	ATS-49	
2.5 x3.2 mm	12 - 54 MHz	-10°C to +70°C	M1253	
2.5 x 4 mm	12 - 32 MHz	-10°C to +85°C	M1254	
3.2 x 5 mm	12 - 54 MHz	-10°C to +70°C	M1325	
5 x 7 mm	9.5 - 150 MHz	-40°C to +85°C	PM	
Contact Factory	Contact Factory	Contact Factory	XR Series	
HC-48/U	See Specifications on Page	See Specifications on Page	MIL-PRF-3098-QPL	
HC-49/U	See Specifications on Page	See Specifications on Page	MIL-PRF-3098-QPL	
HC-50/U	See Specifications on Page	See Specifications on Page	MIL-PRF-3098-QPL	
HC-51/U	See Specifications on Page	See Specifications on Page	MIL-PRF-3098-QPL	

ATSM-49 Crystals

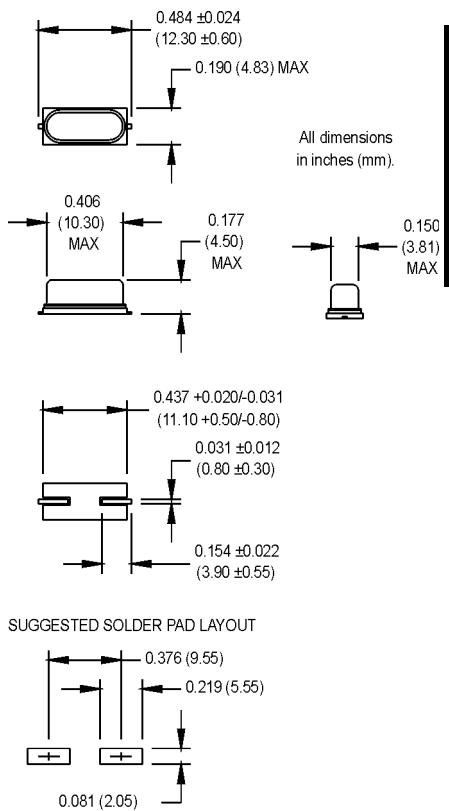

Order by:
***ATSM-49-R 00.0000 MHz** (Frequency)

-R signifies RoHS compliant part

For Custom P/N:

M1001Sxxx - Contact factory for datasheet

Equivalent Series Resistance (ESR), Max.	
Fundamental (AT-cut)	
3.579 to 3.999 MHz	200 Ω
4.000 to 4.999 MHz	150 Ω
5.000 to 5.999 MHz	120 Ω
6.000 to 9.999 MHz	100 Ω
10.000 to 13.999 MHz	80 Ω
14.000 to 40.000 MHz	50 Ω
Fundamental (BT-cut)	
24.000 to 50.000 MHz	100 Ω
Third Overtones (AT-cut)	
25.000 to 39.999 MHz	100 Ω
40.000 to 72.000 MHz	80 Ω



MtronPTI ATSM-49 Options	
Order by part number listed followed by the desired frequency.	
Part No.	Description
520-010-R	Fundamental frequencies, -20°C to +70°C operating temperature
520-230-R	Fundamental frequencies, 20pF load capacitance
520-260-R	Fundamental frequencies, 32pF load capacitance
520-910-R	3 rd overtone frequencies, 18 pF load capacitance
520-930-R	3 rd overtone frequencies, 20pF load capacitance
520-960-R	3 rd overtone frequencies, 32pF load capacitance
522-210-R	Fundamental frequencies, -40°C to +85°C operating temperature
522-215-R	3 rd overtone frequencies, -40°C to +85°C operating temperature
Balance of specifications same as shown in "Electrical Specifications"	
Contact the factory for options not listed above.	

Electrical Specification	PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition/Notes
	Frequency Range	F	3.579545		72	MHz	
	Frequency Tolerance	F/F			±30	ppm	
	Frequency Stability	ΔF/F			±50	ppm	
	Operating Temperature	T _A	-10		+70	°C	
	Storage Temperature	T _S	-55		+125	°C	
	Aging 1 st Year				+3	ppm	
	Thereafter (per year)				+5	ppm	Up to 3 rd year
	Load Capacitance	C _L		18		pF	See Note 2
	Shunt Capacitance	C ₀			7	pF	
Environmental	ESR		See ESR Table				
	Drive Level	D _L	25	100	500	μW	
	Insulation Resistance	I _R	500			MΩ	
	Aging	Internal Specification, 168 hrs. at +55°C					
	Physical Dimensions	MIL-STD-883, Method 2016					
	Shock	MIL-STD-202, Method 213 Condition C, 100 g					
	Vibration	MIL-STD-202, Methods 201 & 204, 10 g from 10-2000 Hz					
	Thermal Cycle	MIL-STD-883, Method 1010, Condition B, -55°C to +125°C					
	Gross Leak	MIL-STD-202, Method 112, 30 sec. Immersion					
	Fine Leak	MIL-STD-202, Method 112, 1 x 10 ⁻⁸ atmcc/sec. min.					
	Resistance to Solvents	MIL-STD-883, Method 2015, Three 1 minute soaks					
	Max Soldering Conditions	See solder profile					

Note 1: BT Cut fundamentals from 24.000 to 40.000 MHz have a tolerance of ±50 ppm and 100 ppm stability. Order by P/N 471-010-R-Frequency.

Note 2: Series resonant designated by "SR" prefix (ie., SRATSM-49-R).

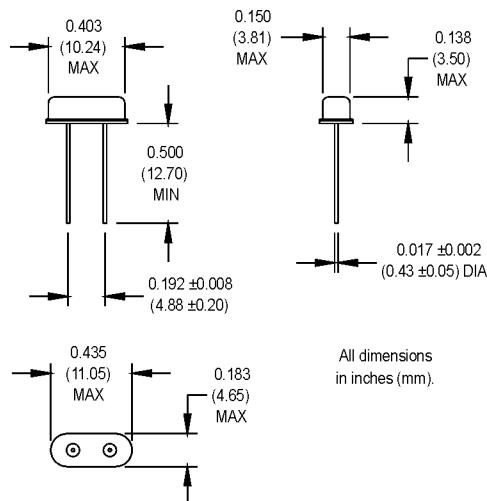
ATS-49 Crystals



*ATS-49 00.0000 MHz (customer specified)

*ATS-49-R 00.0000 MHz (RoHS Compliant and customer specified frequency)

M1004Sxxx - Contact factory for datasheet.



Equivalent Series Resistance (ESR), Max.	ATS-49
Fundamental (AT-cut)	
3.579 to 3.999 MHz	200 Ω
4.000 to 4.999 MHz	150 Ω
5.000 to 5.999 MHz	120 Ω
6.000 to 9.999 MHz	100 Ω
10.000 to 13.999 MHz	80 Ω
14.000 to 40.000 MHz	50 Ω
Fundamental (BT-cut)	
24.000 to 50.000 MHz	100 Ω
Third Overtones (AT-cut)	
25.000 to 39.999 MHz	100 Ω
40.000 to 72.000 MHz	80 Ω

MtronPTI ATS-49 Options

Order by part number listed followed by the desired frequency.

Part No.	Description
397-030	Fundamental, 20pF load, ±30 ppm tolerance, ±50 ppm stability, -10°C to +70°C operating temperature
397-040	Fundamental, series resonant, -10°C to +70°C operating temperature
397-310	Fundamental, 18pF load, -40°C to +85°C operating temperature
482-010	Fundamental, base insulator
482-040	Fundamental, series resonant, base insulator
482-740	Fundamental, series resonant, -40°C to +85°C operating temperature
483-240	3 rd overtone, series resonant, ±30 ppm tolerance, ±50 ppm stability, -40°C to +85°C operating temperature
493-040	3 rd overtone, series resonant

Balance of specifications same as shown in "Electrical Specifications"

Contact the factory for options not listed above.

Electrical Specifications	PARAMETER	Symbol	Min.	Typ.	Max.	Units	Condition/Notes
	Frequency Range	F	3.579545		72	MHz	
	Frequency Tolerance	F/F	-30		+30	ppm	
	Frequency Stability	ΔF/F	-50		+50	ppm	See Note 1
	Operating Temperature	T _A	-10		+70	°C	
	Storage Temperature	T _S	-55		+125	°C	
	Aging Per Year			±5	±5		
	Load Capacitance	C _L		18		pF	See Note 2
	Shunt Capacitance	C _O			7	pF	
	ESR		See ESR Table				
	Drive Level	D _L	25	100	500	μW	
	Insulation Resistance	I _R	500			MΩ	
Environmental	Mechanical Shock	MIL-STD-202, Method 213, C (100 g's)					
	Vibration	MIL-STD-202, Method 201 & 204 (10 g's from 10-2000 Hz)					
	Thermal Cycle	MIL-STD-883, Method 1010, B (-55°C to 125°C, 15 min dwell, 10 cycles)					
	Hermeticity	MIL-STD-202, Method 112 (must meet 1 x 10 ⁻⁸)					
	Solderability	Per EIAJ-STD-002					
	Max Wave Soldering Conditions	+260°C for 10 secs. Max.					

Note 1: BT cut fundamentals from 24.000 to 40.000 MHz have a stability of ±100 ppm

Note 2: Series resonant designated "SR" prefix (i.e., SRATS-49)

M1253 Surface Mount Crystal

2.5 x 3.2 x 0.8 mm



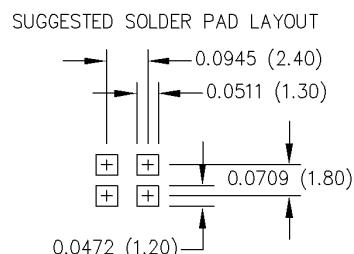
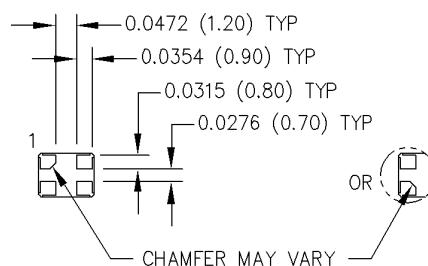
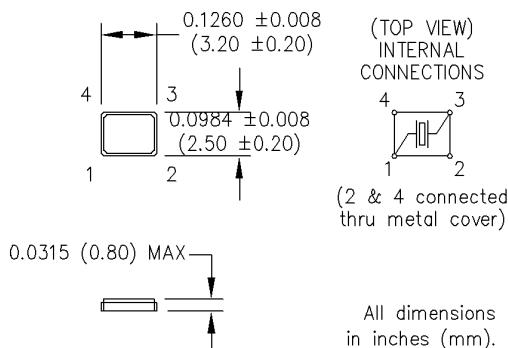
C
R
Y
S
T
A
L

Features:

- Ultra-Miniature Size
- Tape & Reel
- Leadless Ceramic Package - Seam Sealed

Applications:

- Handheld Electronic Devices
- PDA, GPS, MP3
- Portable Instruments
- PCMCIA Cards
- Bluetooth



Ordering Information

M1253	6	J	M	XX	00.0000	MHz
Product Series						
Operating Temperature						
1: -10°C to +70°C	3: -10°C to +60°C					
2: -40°C to +85°C	6: -20°C to +70°C					
Tolerance @ +25°C						
D: ±10 ppm	J: ±30 ppm (std)					
E: ±15 ppm	M: ±50 ppm					
G: ±20 ppm	P: ±100 ppm					
H: ±25 ppm						
Stability						
D: ±10 ppm	J: ±30 ppm					
E: ±15 ppm	M: ±50 ppm (std)					
G: ±20 ppm	P: ±100 ppm					
H: ±25 ppm						
Load Capacitance						
Blank: 18 pF (std)						
S: Series Resonant						
XX: Customer Specified 8 pF to 32 pF						
Frequency (customer specified)						

M1253Sxxx - Contact factory for datasheet.

Electrical Specifications	Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
	Frequency Range	F	12		54	MHz	
	Frequency Tolerance	F/F		See Ordering Information		ppm	+25°C
	Frequency Stability	F/F		See Ordering Information		ppm	Over Operating Temperature
	Operating Temperature	T _{opr}		See Ordering Information		°C	
	Storage Temperature	T _{stg}	-55		+125	°C	
	Aging	F _a			±5	ppm/yr	+25°C
	Load Capacitance	C _L					See Ordering Information
	Shunt Capacitance	C ₀			3	pF	
	ESR						
Environmental	Fundamental AT-Cut Frequencies						
	13.000000 to 19.999999 MHz				80	Ohms	All
	20.000000 to 29.999999 MHz				70	Ohms	All
	30.000000 to 54.000000 MHz				50	Ohms	All
Environmental	Drive Level	D _L	10	100	300	µW	
	Insulation Resistance	I _R	500			Megohms	100 VDC
	Aging	Internal Specification					168 hrs. at +55°C
	Physical Dimensions	MIL-STD-883, Method 2016					
	Shock	MIL-STD-202, Method 213 Condition C					100 g
	Vibration	MIL-STD-202, Methods 201 & 204					10 g from 10-2000 Hz
	Thermal Cycle	MIL-STD-883, Method 1010, Condition B					-55°C to +125°C
	Gross Leak	MIL-STD-202, Method 112					30 sec. Immersion
	Fine Leak	MIL-STD-202, Method 112					1 x 10 ⁻⁸ atmcc/sec. min.
	Resistance to Solvents	MIL-STD-883, Method 2015					Three 1 minute soaks
	Max Soldering Conditions	See solder profile, Figure 1					

MtronPTI reserves the right to make changes to the product(s) and service(s) described herein without notice. No liability is assumed as a result of their use or application. Please see www.mtronpti.com for our complete offering and detailed datasheets. Contact us for your application specific requirements: MtronPTI 1-800-762-8800.

M1254 Surface Mount Crystal

2.5 x 4.0 x 0.75 mm



Features:

- Ultra-Miniature Size
- Tape & Reel
- Leadless Ceramic Package - Seam Sealed
- RoHS Compliant

Applications:

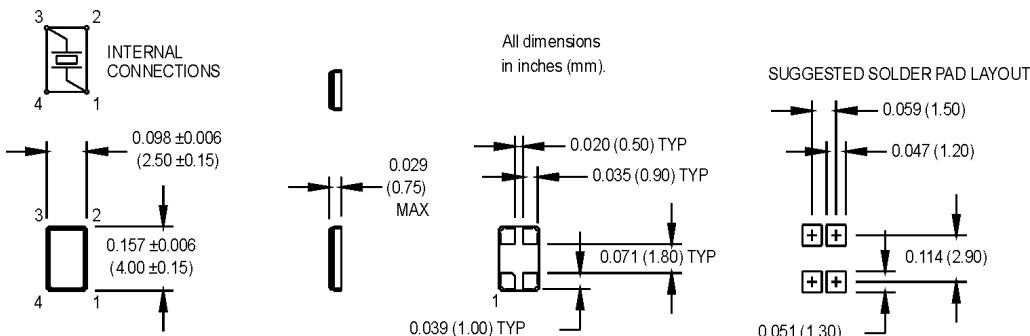
- Handheld Electronic Devices
- PDA, GPS, MP3
- Portable Instruments
- PCMCIA Cards



Ordering Information

M1254	6	J	M	XX	00.0000
Product Series					
Operating Temperature					
1: -10°C to +70°C	3: -10°C to +60°C				
2: -40°C to +85°C	6: -20°C to +70°C				
Tolerance @ +25°C					
*D: ±10 ppm	J: ±30 ppm (std)				
E: ±15 ppm	M: ±50 ppm				
G: ±20 ppm	P: ±100 ppm				
H: ±25 ppm					
Stability					
*D: ±10 ppm	J: ±30 ppm				
E: ±15 ppm	M: ±50 ppm (std)				
G: ±20 ppm	P: ±100 ppm				
H: ±25 ppm					
Load Capacitance					
Blank: 18 pF (std)					
S: Series Resonant					
XX: Customer Specified 10 pF to 32 pF					
Frequency (customer specified)					

* Consult Factory
M1254Sxxx - Contact factory for datasheet.



	Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Electrical Specifications	Frequency Range	F	12		32	MHz	
	Frequency Tolerance	F/F		See Ordering Information		ppm	+25°C
	Frequency Stability	F/F		See Ordering Information		ppm	Over Operating Temperature
	Operating Temperature	T _{opr}		See Ordering Information		°C	
	Storage Temperature	T _{stg}	-55		+125	°C	
	Aging	F _a			±2	ppm/yr	+25°C
	Load Capacitance	C _L					See Ordering Information
	Shunt Capacitance	C ₀			3	pF	
	ESR						
Environmental	Fundamental AT-Cut Frequencies						
	12.000000 to 19.999999 MHz				80	Ohms	All
	20.000000 to 25.999999 MHz				70	Ohms	All
	26.000000 to 32.000000 MHz				50	Ohms	All
	Drive Level	D _L	10	100	300	µW	
	Insulation Resistance	I _R	500			Megohms	100 VDC
	Aging	Internal Specification				168 hrs. at +55°C	
	Physical Dimensions	MIL-STD-883, Method 2016					
	Shock	MIL-STD-202, Method 213 Condition C				100 g	
	Vibration	MIL-STD-202, Methods 201 & 204				10 g from 10-2000 Hz	
	Thermal Cycle	MIL-STD-883, Method 1010, Condition B				-55°C to +125°C	
	Gross Leak	MIL-STD-202, Method 112				30 sec. Immersion	
	Fine Leak	MIL-STD-202, Method 112				1 x 10 ⁻⁸ atmcc/sec. min.	
	Resistance to Solvents	MIL-STD-883, Method 2015				Three 1 minute soaks	
	Maximum Soldering Conditions	See solder profiles, Figure 1					

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M1325 Surface Mount Crystal

3.2 x 5 x 0.8 mm



C
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Features:

- Ultra-Miniature Size
- Tape & Reel
- Leadless Ceramic Package - Seam Sealed

Applications:

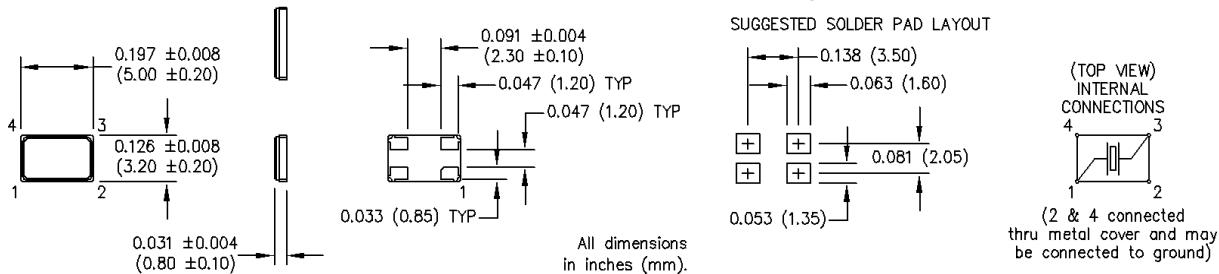
- Handheld Electronic Devices
- PDA, GPS, MP3
- Portable Instruments



Ordering Information

M1325	1	J	M	XX	00.0000
Product Series					
Operating Temperature					
1: 0°C to +70°C	3: -10°C to +60°C				
2: -40°C to +85°C	6: -20°C to +70°C				
Tolerance @ +25°C					
*D: ±10 ppm	J: ±30 ppm (std)				
E: ±15 ppm	M: ±50 ppm				
G: ±20 ppm	P: ±100 ppm				
H: ±25 ppm					
Stability					
*D: ±10 ppm	J: ±30 ppm				
E: ±15 ppm	M: ±50 ppm (std)				
G: ±20 ppm	P: ±100 ppm				
H: ±25 ppm					
Load Capacitance					
Blank: 18 pF (std)					
S: Series Resonant					
XX: Customer Specified 8 pF to 32 pF					
Frequency (customer specified)					

*Consult Factory
M1325Sxxx - Contact factory for data sheet.

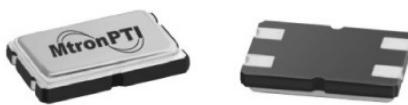


Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Frequency Range	F	12		54	MHz	
Frequency Tolerance	F/F	See Ordering Information			ppm	+25°C
Frequency Stability	F/F	See Ordering Information			ppm	Over Operating Temperature
Operating Temperature	T _{opr}	See Ordering Information			°C	
Storage Temperature	T _{stg}	-55		+125	°C	
Aging	F _a			±5	ppm/yr	+25°C
Load Capacitance	C _L					See Ordering Information
Shunt Capacitance	C ₀			7	pF	
ESR						
Fundamental AT-Cut Frequencies						
12.000000 to 19.999999 MHz				80	Ohms	All
20.000000 to 29.999999 MHz				70	Ohms	All
30.000000 to 54.000000 MHz				50	Ohms	All
Drive Level	D _L	10	50	100	µW	
Insulation Resistance	I _R	500			Megohms	100 VDC
Environmental	Aging	Internal Specification				168 hrs. at +55°C
	Physical Dimensions	MIL-STD-883, Method 2016				
	Shock	MIL-STD-202, Method 213 Condition C				100 g
	Vibration	MIL-STD-202, Methods 201 & 204				10 g from 10-2000 Hz
	Thermal Cycle	MIL-STD-883, Method 1010, Condition B				-55°C to +125°C
	Gross Leak	MIL-STD-202, Method 112				30 sec. Immersion
	Fine Leak	MIL-STD-202, Method 112				1 x 10 ⁻⁸ atmcc/sec. min.
	Max Soldering Conditions	See solder profile, Figure 1				
	Resistance to Solvents	MIL-STD-883, Method 2015				Three 1 minute soaks

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PM Surface Mount Crystals

5.0 x 7.0 x 1.3 mm



Available Stabilities vs. Temperature

T	S	D	F	G	H	J	M	P
1	A	A	A	A	A	A	S	A
2	N	A	A	A	A	A	A	A
3	N	N	N	N	N	N	A	A
4	N	N	N	N	N	N	A	A
5	N	A	A	A	A	A	A	A
6	N	A	A	A	A	A	A	A

A = Available

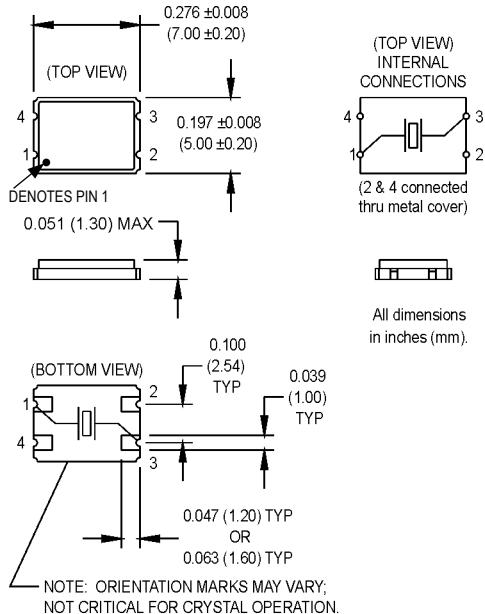
S = Standard

N = Not Available

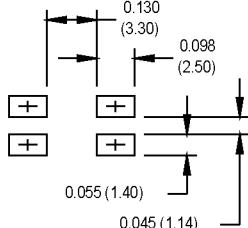
Ordering Information

PM	1	M	M	XX	00.0000
Product Series					
Temperature Range					
1: 0°C to +70°C		2: -40°C to +85°C		3: -55°C to +105°C	
4: -55°C to +125°C		5: -10°C to +85°C		6: -20°C to +70°C	
Tolerance					
D: ±10 ppm		F: ±15 ppm		G: ±20 ppm	
H: ±25 ppm		J: ±30 ppm		M: ±50 ppm	
Stability					
D: ±10 ppm		F: ±15 ppm		G: ±20 ppm	
H: ±25 ppm		J: ±30 ppm		M: ±50 ppm	
P: ±100 ppm		Load Capacitance		Blank: 18 pF (std)	
S: Series Resonant		XX: Customer Specified 10 pF to 32 pF		Frequency (customer specified)	

M1007Sxxx - Contact factory for datasheet.



SUGGESTED SOLDER PAD LAYOUT



PARAMETERS		VALUE
Frequency Range*		8,000 to 150,000 MHz
Tolerance @ +25°C		See Table Above
Stability		See Table Above
Aging		±5 ppm/yr Max
Shunt Capacitance		5 pF Max.
Load Capacitance		See ordering information
Standard Operating Conditions		See Table Above
Equivalent Series Resistance (ESR), Max.		
Fundamental (AT-cut)		
8,000 to 10,999 MHz		60 Ω
11,000 to 13,999 MHz		50 Ω
14,000 to 15,999 MHz		40 Ω
16,000 to 40,500 MHz		30 Ω
Third Overtones (AT-cut)		
35,000 to 39,999 MHz		100 Ω
40,000 to 49,999 MHz		80 Ω
50,000 to 90,000 MHz		100 Ω
Fifth Overtones (AT-cut)		
90,000 to 150,000 MHz		100 Ω
Drive Level		100 μW Max., 50 μW Typ., 10 μW Min.
Mechanical Shock		MIL-STD-202, Method 213, C
Vibration		MIL-STD-202, Method 201 & 204
Thermal Cycle		MIL-STD, Method 1010, B
Max Soldering Conditions		See solder profile, Figure 1

* Because this product is based on AT-strip technology, not all frequencies in the range stated are available. Contact the factory for availability of specific frequencies.

XR Series

Precision Crystal Resonators

MtronPTI is a leader in the field of developing and manufacturing Precision Crystal Resonators for High-Reliability applications as well as internal use in various Oscillator products. Below is a brief summary of the typical products and performance characteristics you can expect. When you need custom, high-rel products, contact our Application Engineering hotline (1-800-762-8800) for quick, complete support.

Applications (typical):

- Space and Satellite
- Military
 - RF Communications
 - Electronic Weapons
- Avionics
- Telecommunications
- Instrumentation



Key Performance & Characteristics (typical):

- Frequency range: 3 to 200 MHz
- Cut: AT, SC, IT, etc.
- Overtone: Fundamental, 3rd, 5th and 7th
- Operating temperatures to -55°C to 125°C
- Low Phase noise
(-130dBc/Hz @ 100Hz offset for 10.00 MHz/3rd/SC/TO8)
- Low aging rate
(0.5x10⁻⁹ per day typical for 10.00 MHz/3rd/SC/TO8)
- Low g-sensitivity
(1x10⁻⁹ per axis typical for 10.00 MHz/3rd/SC/TO8)
- High shock capable & Vibration resistant
 - Test Capability: Shock to 50K g long-impulse, high shock, in-house test capability
 - Sine and random vibration profiles
- High Reliability test capability
- RoHS capable (if required)



Package Options (Cold Weld & Resistance Weld):

- H45, H43/H18, H12, and H6
- TO5, TO8, and H40



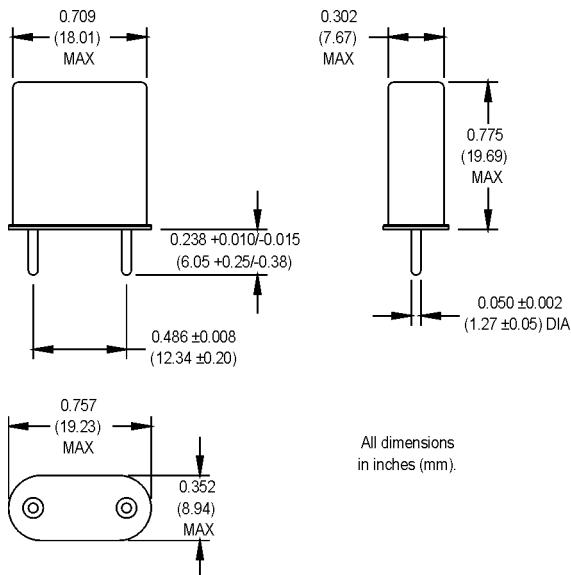
Contact MtronPTI's Application Engineering team to help configure your specific Precision Crystal Resonator today!
Phone: 1-800-762-8800 or E-mail: FAE@mtronpti.com

MIL-PRF-3098 QPL Crystals

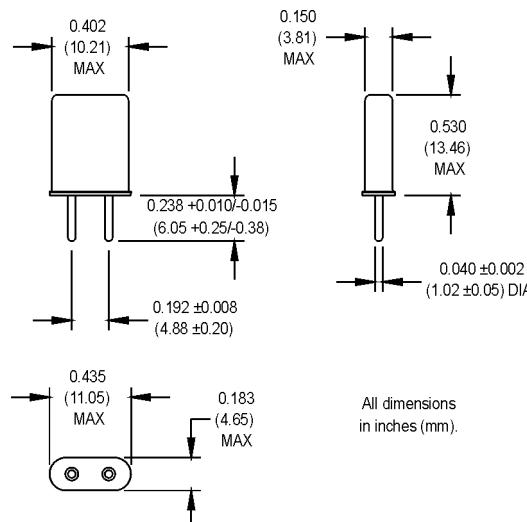
Crystals qualified under MIL-PRF-3098

MtronPTI has been a QPL'd supplier of military quartz crystals since 1967. Crystal designs requiring military approval fall into two categories, those which have been subjected to formal QPL qualification under MIL-PRF-3098 and others too new and/or too limited in quantity to have been so certified. MtronPTI does both in a MIL-STD-790 certified facility.

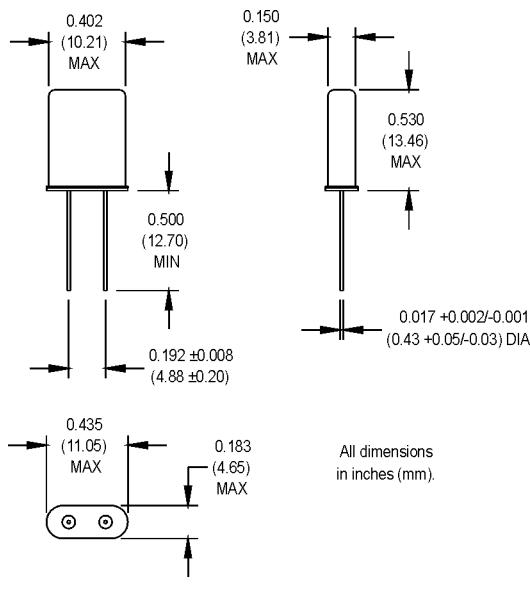
HC-48/U 00.0000 MHz (customer specified)



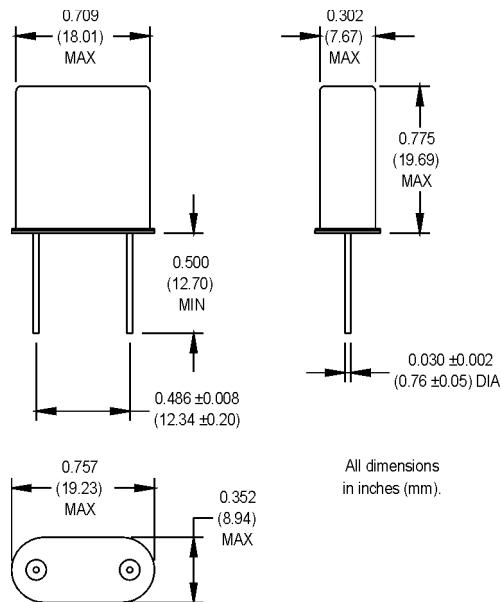
HC-50/U 00.0000 MHz (customer specified)



HC-49/U 00.0000 MHz (customer specified)



HC-51/U 00.0000 MHz (customer specified)



MIL-PRF-3098 QPL Crystals

Electrical Specifications

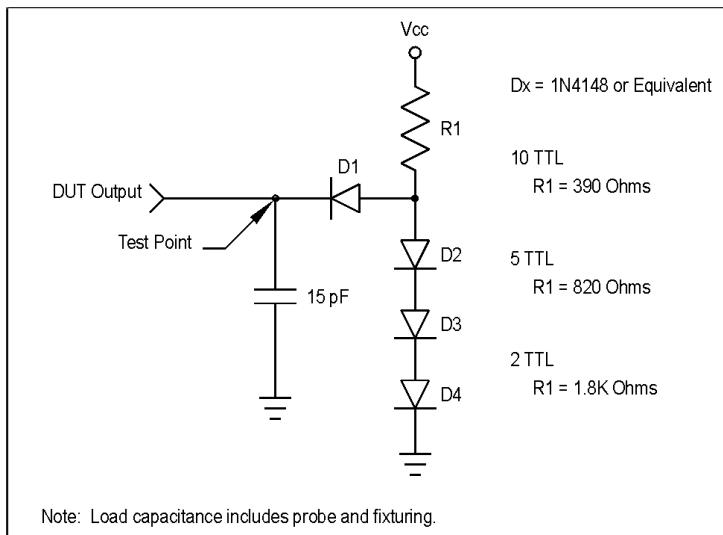
CR Type	Slash Sheet	Frequency Range (MHz)	Frequency Tolerance (ppm)	Operating Temperature	Resistance Weld Holder	Load Cap. (pF)
CR-18/U	/3	1.000 to 20.000	50	-55°C to +105°C	HC-48/U	32.0
CR-19/U	/4	1.000 to 20.000	50	-55°C to +105°C	HC-48/U	series
CR-52/U	/30	10.000 to 61.000	50	-55°C to +105°C	HC-48/U	series
CR-55/U	/33	17.000 to 61.000	50	-55°C to +105°C	HC-49/U	series
CR-60/U	/38	5.000 to 20.000	50	-55°C to +105°C	HC-49/U	series
CR-64/U	/42	2.400 to 20.000	50	-55°C to +105°C	HC-49/U	30.0
CR-67/U	/45	17.000 to 61.000	25	-55°C to +105°C	HC-49/U	series
CR-76/U	/53	16.000 to 61.000	20	-40°C to +90°C	HC-49/U	series
CR-78/U	/62	2.200 to 20.000	50	-55°C to +105°C	HC-50/U	30.0
CR-79/U	/63	2.900 to 20.000	50	-55°C to +105°C	HC-50/U	series
CR-81/U	/58	17.000 to 61.000	50	-55°C to +105°C	HC-50/U	series
CR-97/U	/72	8.000 to 10.000	50	-40°C to +85°C	HC-49/U	32.0
CR-106/U	/82	10.500 to 11.500	50	-55°C to +105°C	HC-49/U	32.0
CR-117/U	/93	30.000 to 61.000	15	-40°C to +65°C	HC-50/U	series
CR-139/U	/118	20.000 to 22.000	50	-55°C to +105°C	HC-49/U	30.0
CR-157/U	/137	1.000 to 20.000	50	-55°C to +105°C	HC-51/U	series

Contact the factory for availability of specific frequencies below 2.000 MHz.

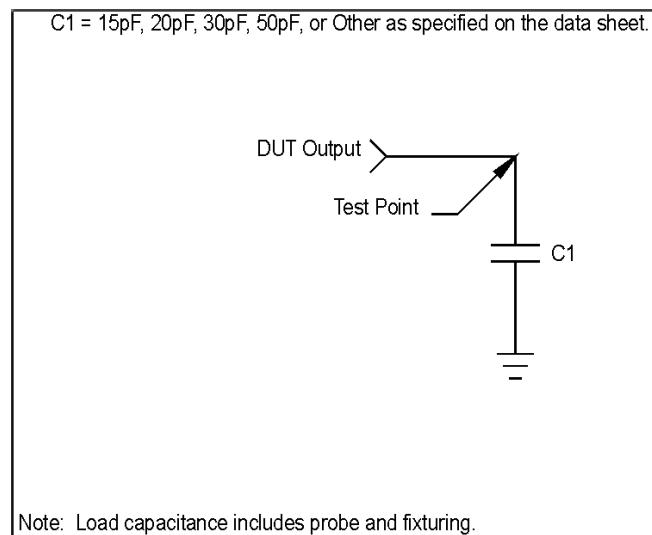
Load Circuit Diagrams

The load circuits shown are typical of the test loads used to measure wave form parameters for the various oscillator logic families. Please consult the factory for applications requiring special load considerations.

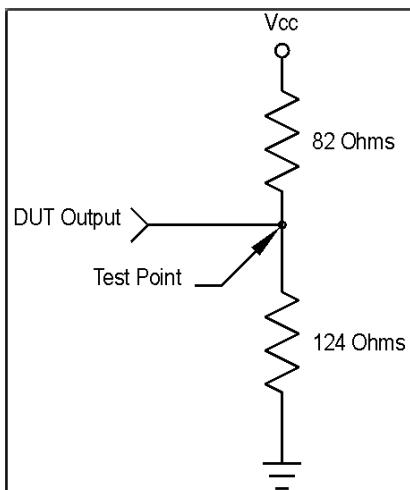
Load Circuit #1 - TTL



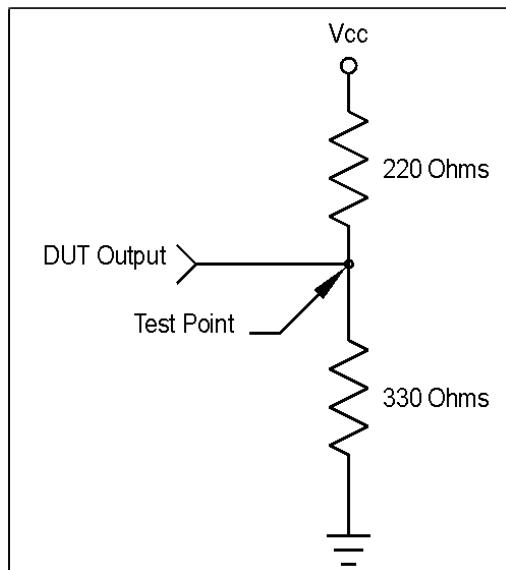
Load Circuit #2 - HCMOS



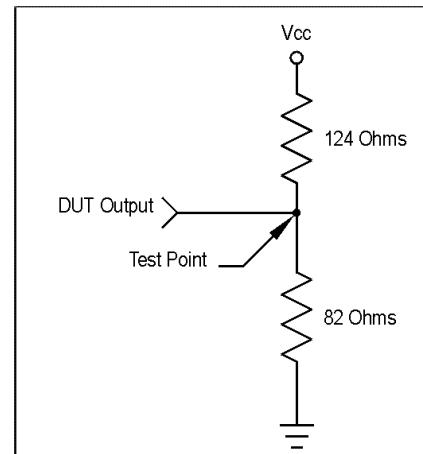
Load Circuit #3 - ECL 5 Volt
50 Ohms



Load Circuit #4
ECL Standard



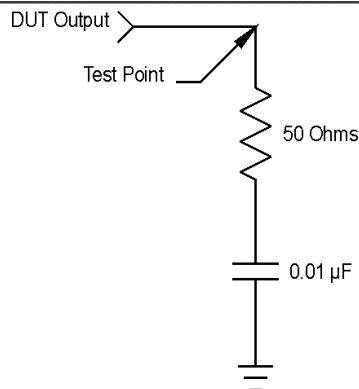
Load Circuit #5 - ECL 3.3 Volt
50 Ohms



Load Circuit Diagrams

The load circuits shown are typical of the test loads used to measure wave form parameters for the various oscillator logic families. Please consult the factory for applications requiring special load considerations.

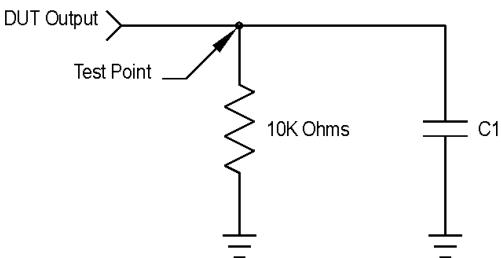
Load Circuit #6 - AC/MOS
50 Ohms



Note: Load capacitance includes probe and fixturing.

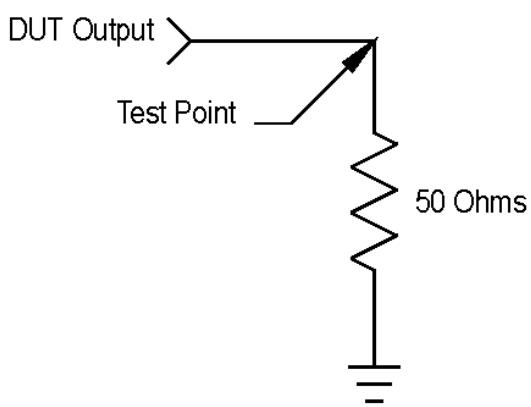
Load Circuit #7 - Clipped
Sinewave
TCXO/TCVCXO

C1 = 10pF, 15pF, or Other as specified on the data sheet.

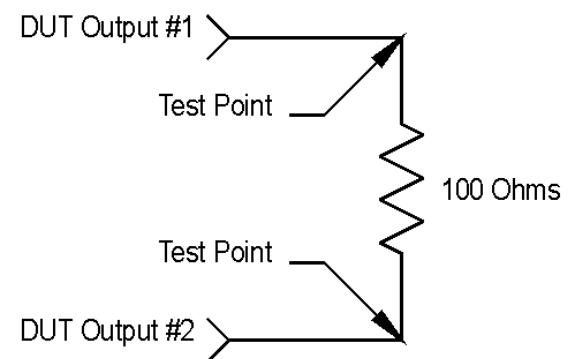


Note: Load capacitance includes probe and fixturing.

Load Circuit #8 - 50 Ohms



Load Circuit #9
100 Ohms Outpt
to Output Termination



Solder Profiles

Typical Soldering Conditions for Surface Mount Crystals and Oscillators (Figures 1 and 2)

Figure “1”

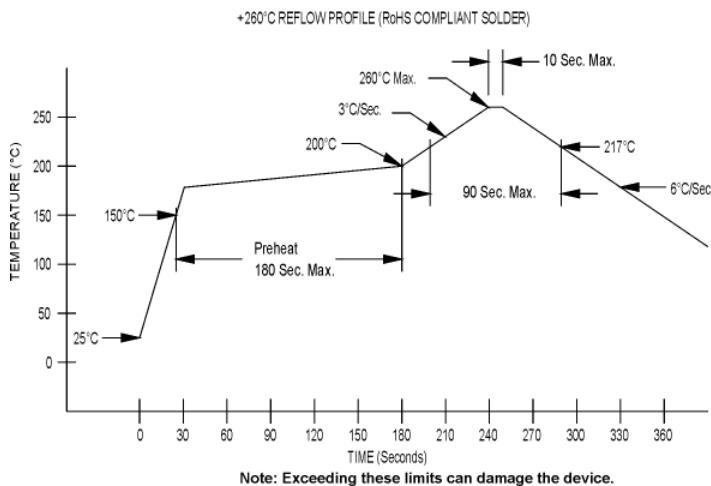
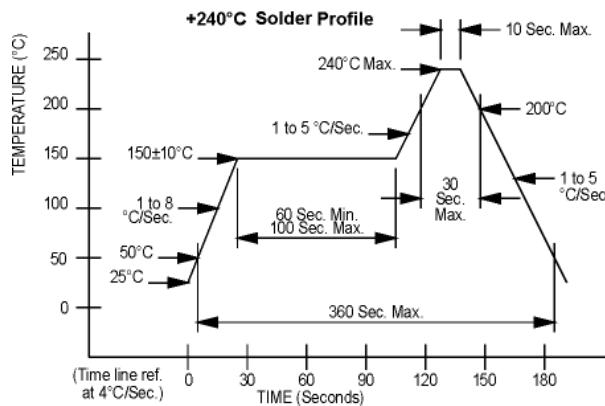


Figure “2”



Typical Soldering Conditions for Through Hole Crystals and Oscillators:

Per MIL-STD-202, Method 210 “Resistance to Soldering Heat”, Condition C.

Details:

Wave solder with a solder bath temperature of $260^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and an exposure time of 10 ± 1 second. Preheat $1-4^{\circ}\text{C/s}$ to within 100°C of solder temperature (25 ± 6 mm/s).

**Need Help in your Design?
Call us at
1-800-762-8800**

Alphabetical Product Index

Product	Page	Product	Page	Product	Page
ATS-1	See web	K1400A	See web	M2	82-83
ATS-2	See web	K1523BA	See web	M2001	See web
ATS-49	100	K1524A	See web	M2032	78
ATSM49	99	K1525C	See web	M2033	78
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CIM	See web	K1526B	See web	M2035	See web
CMO3	See web	K1526BLC	See web	M2036	See web
CMO5	See web	K1526C	See web	M2037	See web
CMV	See web	K1526CLC	See web	M2052	86-87
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CTM5001A	See web	K1536B	See web	M220x	94-95
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CTM5035AQA	See web	K1570AQG	See web	M320x	72-73
CTM5035AQB	See web	K1570AQH	See web	M3A	See web
CTM5100A	See web	K1573A	See web	M3E	See web
CTM5100R	See web	K1601	See web	M3EH	See web
F1100C	See web	K1601T	See web	M3H	See web
F1139BA	See web	K1601TE	See web	M3L	See web
F1300C	See web	K1602	See web	M3M	See web
F1400A	See web	K1602SE	See web	M3R	See web
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